

POPULAR SCIENCE

MONTHLY
MECHANICS - AUTOS - HOMEBUILDING

Robot
Hand T
PAGE



25¢

December



U.S. Now Flies
World's Fastest Fighter

PAGE 94

Studebaker's
New Wagon

PAGE 110

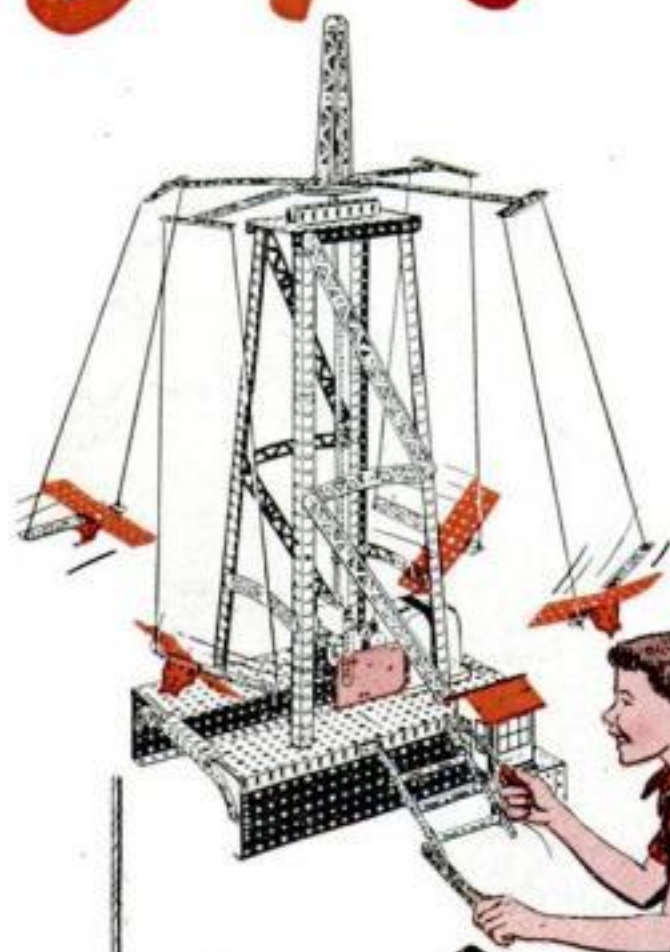
Home Uses
for Aluminum

PAGE 159



BOYS! Get **ERECTOR**[®]

and build hundreds of action models



Put together these gleaming STEEL precision parts and create hundreds of toys! Illustrated "How to Make 'Em" book in every set. But you can do your own inventing! Models whistle, "choo-choo," light up and puff smoke. Tell Dad you want ERECTOR and see displays at stores. For ERECTOR and Gilbert Toy Book (plus American Flyer trains) write Gilbert Hall of Science, Dept. N, Erector Square, New Haven 6, Conn. Enclose 10¢ for handling, postage.



Make this high-swinging airplane ride with ERECTOR No. 6 1/2.

No. 6 1/2 has over 350 parts — sturdy girders, gears, wheels, etc. "Powerhouse" electric engine features many speeds (including reverse) to put *action* into your models. Builds pile driver, elevator, lift bridge, hundreds of other wonderful toys that work. **\$12.95***

Square Girder Construction
Precision-matched parts easily lock together with nuts and bolts. Can't wobble or warp. Build bridges that hold more than 200 pounds. Parts have lasting gleam.

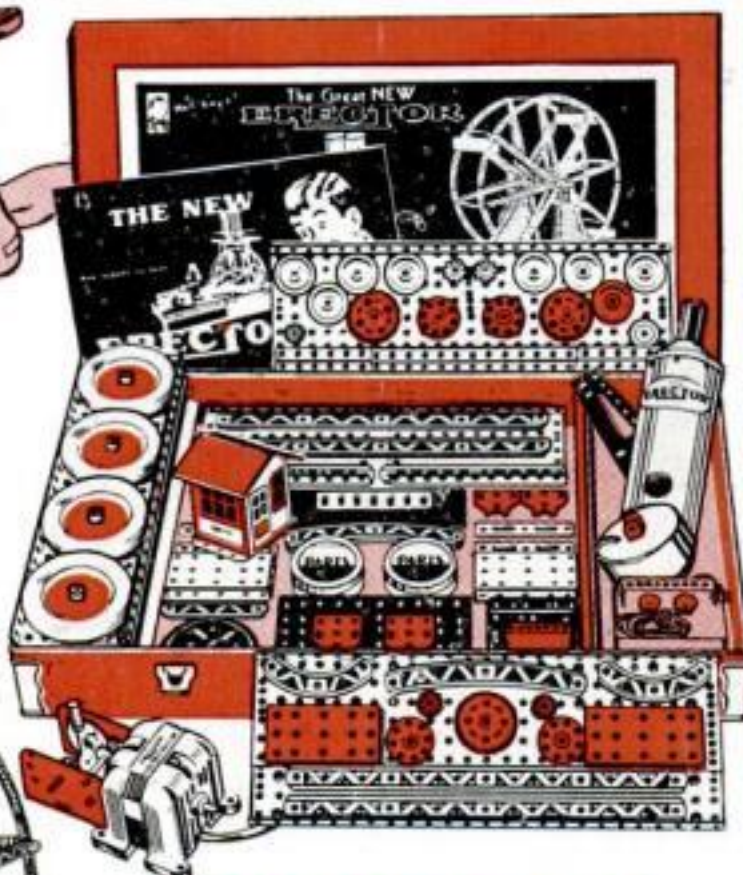


*ERECTOR prices slightly higher Denver and West



Huge ferris wheel turns fast or slow; reverses. Made with ERECTOR No. 8 1/2.

The all-electric set (No. 8 1/2) has nearly 16 lbs. of parts! Includes 4-speed forward and reverse electric engine, electric lights, electro-magnet! Build a mighty crane, oil drilling rig, portable derrick, etc. Heavy gauge steel chest. **\$23.50***



WORLD'S MOST FASCINATING CHRISTMAS GIFT

JR. ENGINEERS AT WORK WITH ERECTOR!

ERECTOR PRICES START AT \$2.00*

"OWN a Business" Coupon

DURACLEAN CO., 3-18D Duraclean Bldg., Deerfield, Illinois

Without obligation to me, send booklet and letter giving full details. Tell me how I may OWN a growing business of my own built upon satisfied customers.

Name _____

Address _____

City _____

State _____

We'll train & establish you.



Are You The Man?

If you are dependable, honest and willing to work to own a large-profit, lifetime business and become financially independent, we invite you to mail the above coupon for full details. We are now enlarging this 23-year-old, world-wide chain of **individually-owned** service businesses. We'll establish you in YOUR OWN business and help

finance you. You use successful methods of established Duraclean dealers. This is a nationally advertised, lifetime business. You can average \$5.00 hourly gross profit on service you render and \$3.00 on **EACH** of your servicemen at National Price Guide charges. **Easy to learn . . . quickly established.**

Revive, Clean and Protect Rugs and Upholstery!

The remarkable Duraclean Service (illustrated below) restores the natural fibre lubrication of wool and other animal fibres. Resiliency returns to the pile. It rises again. Brilliant colors revive. Results in many instances are almost unbelievable.

Duraclean Service banishes the need of cleaning upholstery, rugs and carpeting by harsh machine scrubbing and soaking. It eliminates harmful solvents and strong soaps.

The aerated foam, created by the **patented** electric Foamovator, cleans by **ABSORPTION**—not by scrubbing. Dirt, grease and many unsightly spots vanish like magic. Furnishings become clean, fresh, enlivened.

Forestall Damage by Moths & Carpet Beetles

The Duraproof Service (illustrated above) not only kills moths and carpet-beetles but is also **WARRANTED** to make fabrics **repellent** to both. The U. S. Government says, "**Moths are present in practically every household. . . . No section of the country seems free from such infestations.**" Damage to household goods and wearing apparel is greater from moths than from fire. This modern treatment **DEFINITELY PROTECTS** rugs, carpets, upholstery, furs, clothing, blankets, piano-felts, auto interiors, etc.

What Dealers Say—

W. Lookiebill: "We've had 20 years of pleasant dealings. I'm 65 but am setting my sights for 20 more years."

G. F. Munroe: "Took in \$8,198.26 first 12 months."

P. Freidinger: "We had a big moth-proof business last year; one job alone was \$322.25."

R. Kimbrough: "Finished First White House of Confederacy and am to Duraclean the Governor's Mansion."

Q. Corbett (Canada): "Several hundred dollars in jobs lined up from canvassing."

H. Satterfield: Duracleaned chair for largest department store and got order for 60-75 chairs, couches & davenports."

E. Schenk: "The customers I had on House and Garden ads were very pleased. Their furnishings came out beautiful."

A. Ullman: "It is very encouraging that every demonstration has been a sale."

Margarette Turner: "Took in \$106 and worked 15 or 18 hours."

L. Johnson: "Each customer leads to 3 or 4 more."

No Shop Needed—EASY to Learn

No overhead expense. Service may be rendered in homes, offices, hotels, theaters, institutions, etc., by your service men. Auto dealers have upholstery revived in used cars. Some Duracleaners establish shops or an office — others operate from their homes.

Start Part or Full Time

No experience needed. We show you 27 ways to get customers. Almost **every building** houses a potential customer. A waiting market is in small and large towns alike. These year-round services are in constant need.

Nationally Advertised

Your services are advertised in magazines such as Life, McCall's, House & Garden, Ladies Home Journal, House Beautiful, New Yorker, Better Homes & Gardens, etc. These ads give your services national prestige.

Easy Terms!

A moderate payment establishes **your own business**—pay balance from profits. We furnish electric machines, folders, store-cards, introduction slips, sales book, demonstrators and enough materials to return your **TOTAL** investment. You can have your business operating in a **very few days**. Mail above coupon. No obligation.

Repeat & Voluntary Orders

Demonstrations win customers. Duracleaners find **REPEAT** and **VOLUNTARY** orders a main income. Customers, enthused at results, tell friends and neighbors. Your service is recommended nationally by America's foremost furniture and department stores.

Double Profits

You enjoy large profits on both materials and labor. To start, you may want to render service yourself. You have co-operation of a world-wide organization interested in **YOUR** success.

FREE Booklet

Our letter and **FREE** 16 page illustrated booklet will explain everything—these modern urgently needed services, the waiting market, how business grows, your large profits, easy terms and protected territory. Mail coupon **TODAY**. No obligation.

**OWN
a Growing
BUSINESS**



An established **DURACLEAN** dealer will work with you

World-wide Services

DURACLEAN CO., 3-18D Duraclean Bldg., Deerfield, Illinois

Mail Coupon TODAY—While Territory Is Open

DECEMBER 1953 |

America's Leading New-Idea Magazine for 81 Years

Founded 1872, Vol. 163: No. 6



Mechanics and Handicraft
REG. U. S. PAT. OFF.

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They claim this coupon brings you "good luck"



"Six months after mailing the coupon, I had a promotion and a big raise in pay!"



"From the moment I marked the coupon, my luck changed!"



"My break came when I sent the coupon!"

These statements are typical! I. C. S. gets letters like these regularly. Coupon senders report pay raises. Others win important promotions or new, interesting assignments. Still others find happiness, job security, opportunities never dreamed possible.



Is it LUCK? The results are so impressive, so quick in coming, that some say the I.C.S. coupon is "lucky." Of course, that's not true. The real reason for these amazing results is what happens to the person when he or she mails the coupon.

Coupon is first step! Naturally, you want to make good. But you've put off doing something about it. Mailing this coupon is *definite action!* It shows you're fed up with waiting for the breaks. You're determined to make your own breaks! And this determination alone accounts for much of the "luck" you'll start to experience.



You get free guidance! Within a few days you get the helpful and inspiring 36-page book, "How to Succeed." It's crammed with information. For example, it tells you in detail how to plan your career. Also how to prepare for advancement. In addition, you get a free catalog on the I.C.S. course that interests you. With your new-found determination and these two books as your guides, you're ready to cash in on your hidden abilities!

391 I.C.S. courses! You'll find a partial list of courses in the coupon below. Each course is up-to-date, extremely practical, completely success-tested. You study in your spare time. Set your own pace. Correspond directly with instructors. Cost is low. Diplomas are awarded to graduates. I. C. S. training rates high in all fields of business and industry. You won't find another school like it.

Call it being "lucky" or being "smart." Whatever it is, you're one step closer to your goal when you mail this famous coupon!

I.C.S.—the lifetime Christmas gift

I. C. S., Scranton 9, Penna.

INTERNATIONAL CORRESPONDENCE SCHOOLS

ICS

BOX 7665-N, SCRANTON 9, PENNA.

Without cost or obligation, send me "HOW to SUCCEED" and the booklet about the course BEFORE which I have marked X:

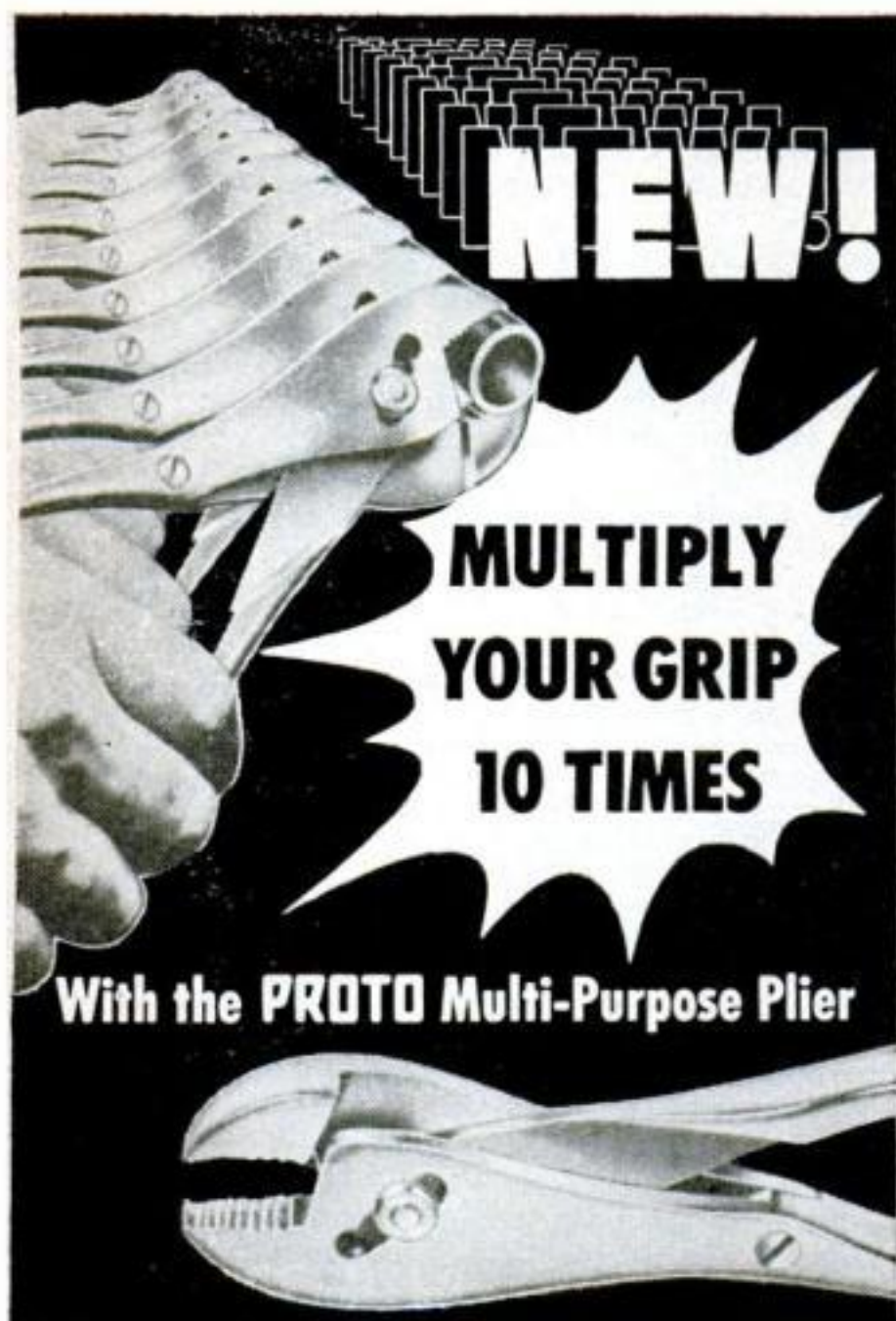
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|---|---|---|---|---|
| ART
<input type="checkbox"/> Commercial Art
<input type="checkbox"/> Magazine Illustrating
<input type="checkbox"/> Fashion Illustrating
<input type="checkbox"/> Cartooning
<input type="checkbox"/> Sketching and Painting
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AVIATION
<input type="checkbox"/> Aeronautical Engineering Jr.
<input type="checkbox"/> Aircraft Engine Mechanic
<input type="checkbox"/> Airplane Drafting
BUILDING
<input type="checkbox"/> Architecture
<input type="checkbox"/> Arch. Drafting
<input type="checkbox"/> Building Contractor
<input type="checkbox"/> Estimating
<input type="checkbox"/> Carpenter and Mill Work
<input type="checkbox"/> Carpenter Foreman
<input type="checkbox"/> Reading Blueprints
<input type="checkbox"/> House Planning
<input type="checkbox"/> Plumbing | <input type="checkbox"/> Heating
<input type="checkbox"/> Painting Contractor
<input type="checkbox"/> Air Conditioning
<input type="checkbox"/> Electrician
BUSINESS
<input type="checkbox"/> Business Administration
<input type="checkbox"/> Certified Public Accountant
<input type="checkbox"/> Bookkeeping and Accounting
<input type="checkbox"/> Office Management
<input type="checkbox"/> Stenography and Typing
<input type="checkbox"/> Secretarial
<input type="checkbox"/> Federal Tax
<input type="checkbox"/> Business Correspondence
<input type="checkbox"/> Letter-writing Improvement
<input type="checkbox"/> Personnel and Labor Relations
<input type="checkbox"/> Advertising
<input type="checkbox"/> Retail Business Management
<input type="checkbox"/> Managing Small Business
<input type="checkbox"/> Ocean Navigation
<input type="checkbox"/> Sales Management
<input type="checkbox"/> Short Story Writing
<input type="checkbox"/> Creative Salesmanship
<input type="checkbox"/> Traffic Management
CHEMISTRY
<input type="checkbox"/> Chemical Engineering
<input type="checkbox"/> Chemistry
<input type="checkbox"/> Analytical Chemistry | <input type="checkbox"/> Petroleum—Nat'l Gas
<input type="checkbox"/> Pulp and Paper Making
<input type="checkbox"/> Plastics
CIVIL, STRUCTURAL ENGINEERING
<input type="checkbox"/> Civil Engineering
<input type="checkbox"/> Structural Engineering
<input type="checkbox"/> Surveying and Mapping
<input type="checkbox"/> Structural Drafting
<input type="checkbox"/> Highway Engineering
<input type="checkbox"/> Reading Blueprints
<input type="checkbox"/> Construction Engineering
<input type="checkbox"/> Sanitary Engineering
DRAFTING
<input type="checkbox"/> Aircraft Drafting
<input type="checkbox"/> Architectural Drafting
<input type="checkbox"/> Electrical Drafting
<input type="checkbox"/> Mechanical Drafting
<input type="checkbox"/> Structural Drafting
<input type="checkbox"/> Sheet Metal Drafting
<input type="checkbox"/> Ship Drafting
<input type="checkbox"/> Mine Surveying and Drafting
ELECTRICAL
<input type="checkbox"/> Electrical Engineering
<input type="checkbox"/> Electrician
<input type="checkbox"/> Electrical Maintenance | <input type="checkbox"/> Electrical Drafting
<input type="checkbox"/> Electric Power and Light
<input type="checkbox"/> Lineman
HIGH SCHOOL
<input type="checkbox"/> High School Subjects
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Commercial
<input type="checkbox"/> Good English
MECHANICAL AND SHOP
<input type="checkbox"/> Mechanical Engineering
<input type="checkbox"/> Industrial Engineering
<input type="checkbox"/> Industrial Supervision
<input type="checkbox"/> Foremanship
<input type="checkbox"/> Mechanical Drafting
<input type="checkbox"/> Machine Design-Drafting
<input type="checkbox"/> Machine Shop Practice
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<input type="checkbox"/> Industrial Instrumentation
<input type="checkbox"/> Machine Shop Inspection
<input type="checkbox"/> Reading Blueprints
<input type="checkbox"/> Toolmaking
<input type="checkbox"/> Gas—Electric Welding
<input type="checkbox"/> Heat Treatment—Metallurgy
<input type="checkbox"/> Sheet Metal Work
<input type="checkbox"/> Sheet Metal Pattern Drafting
<input type="checkbox"/> Refrigeration | POWER
<input type="checkbox"/> Combustion Engineering
<input type="checkbox"/> Diesel—Electric
<input type="checkbox"/> Electric Light and Power
<input type="checkbox"/> Stationary Steam Engineering
<input type="checkbox"/> Stationary Fireman
RADIO, TELEVISION COMMUNICATIONS
<input type="checkbox"/> Practical Radio—TV Eng'ring
<input type="checkbox"/> Radio Operating
<input type="checkbox"/> Radio and TV Servicing
<input type="checkbox"/> Television—Technician
<input type="checkbox"/> Electronics
<input type="checkbox"/> Telephone Work
RAILROAD
<input type="checkbox"/> Locomotive Engineer
<input type="checkbox"/> Diesel Locomotive
<input type="checkbox"/> Air Brakes <input type="checkbox"/> Car Inspector
<input type="checkbox"/> Railroad Administration
TEXTILE
<input type="checkbox"/> Textile Engineering
<input type="checkbox"/> Cotton, Rayon, Woolen Mfg.
<input type="checkbox"/> Carding and Spinning
<input type="checkbox"/> Warping and Weaving
<input type="checkbox"/> Loom Fixing <input type="checkbox"/> Throwing
<input type="checkbox"/> Finishing and Dyeing
<input type="checkbox"/> Textile Designing |
|---|---|---|---|---|

Name _____ Age _____ Home Address _____

City _____ Zone _____ State _____ Working Hours _____ A.M. to P.M. _____

Occupation _____

Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada. . . . Special tuition rates to members of the U. S. Armed Forces.



Try the sensational PROTO No. 234 Multi-Purpose Plier and you will want one for sure! Using a patented three-piece compound leverage design, pressure applied to the handles is increased *ten times* at the jaws! This plier is actually "a chest of tools in one." It securely holds square, round and even tapered objects. To make your work easier, buy one today!

Choose PROTO for Your Other Plier Needs
In the extensive PROTO line, you will find the right size and style of plier for almost every job. And remember that every one has true *professional quality*. Send 10¢ for complete 68-page catalog to

PLOMB TOOL COMPANY

2257A Santa Fe Ave.,
Los Angeles 54, Calif.

New—the No. 243 Multiple-Groove Joint Plier, which Handles Hundreds of Jobs. Five-Position, Tongue-and-Groove Joint Prevents Slippage.

5384



Eastern Factory: Jamestown, N.Y.
Canadian Factory: London, Ont.



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NEXT MONTH . . .

How Anyone Can Plaster



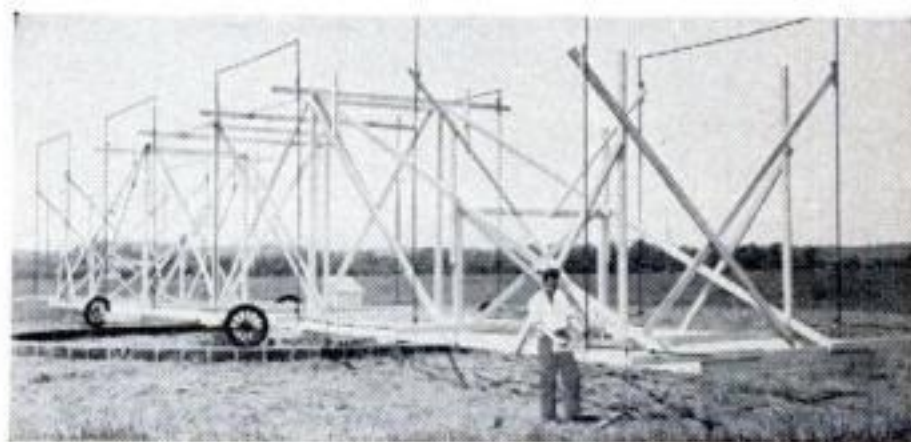
Metal lath that can be nailed over an old wall, plus easily worked lightweight plasters and new textured paints, make it possible to do a good-looking job in a weekend or two. For January, POPULAR SCIENCE MONTHLY will show you how to use these popular finishes to make old walls look new, new ones look better.



How silent is the night?

Watching the serenity of Christmas skies, we are conscious of deep silence. Yet the stars are talking to us all the while—talking in radio waves that are full of meaning to scientists probing the depths of space.

The important discovery that some stars produce radio waves was made by a Bell Laboratories scientist while exploring atmospheric disturbances which might interfere with transoceanic telephone service. His discovery marked the birth of the fast-growing science of radio astronomy. It is telling us of mysterious lightless stars that broadcast radio waves, and it promises exciting revelations about vast regions of space concealed by clouds of cosmic dust.



Directional radio antenna used by Karl G. Jansky, in the discovery of stellar radio signals at the Holmdel, New Jersey, branch of Bell Telephone Laboratories. In 1932 he detected waves of 14.6 meters coming from the direction of Sagittarius in the Milky Way.

It is another example of how Bell Telephone Laboratories scientists make broad and important discoveries as they seek ways to make your telephone serve you better.



BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

NEWS FROM SCIENCE ABOUT YOUR HAIR



V-7

— new
grooming discovery
outdates messy oils

Not an animal, vegetable or mineral oil, V-7 in new Vitalis Hair Tonic is a completely new greaseless grooming agent.

PROOF

you don't need
grease to
correct dryness



New research on human hair shows that even very dry hair regains its normal moisture content faster with new Vitalis than with any leading cream or oil hair tonic.

**KEEPS YOUR HAIR NEAT ALL DAY
—GREASELESSLY**

Even hard-to-manage hair stays neatly in place with Vitalis. No gummy film or "oil-slick" look.



New, finer
VITALIS®
Hair Tonic with V-7
Product of Bristol-Myers

Letters

Dowsing Defended and Doubted

At the end of his article on water witching [Oct., p. 99], Howard Meyerhoff said he didn't know why the stick he had held had bent down where there was underground water. He said he wished he did know.

I can tell him. I have witched a good many wells, and I can tell to within a few feet where a well lies, even if it's 100 feet below the surface.

You can even witch over a river and your fork won't work unless there is a vein of water-bearing mineral gravel beneath it.

It's the minerals in the gravel that make the switch bend down, not the water. I can prove that if anyone should want me to.

FRANK C. DEMARS, Minneapolis.

Being a confirmed skeptic, a graduate chemist with some training in geology, I had always thought that there was nothing to



this business of dowsing until a nurseryman demonstrated the art to me near Niles, Mich. I, of course, thought he was a nut, but he handed the dowsing rod to me, and the thing began to work! I didn't want to believe it, and I tried to explain it to myself as a result of suggestion, etc. However, the rod continued to work for me and still does. I tried it with many of my friends, and I have found that perhaps one to three in 10 people can feel the pull of the rod in certain places.

Although I will agree that the rod is attracted by some force, I do not agree that it necessarily points to water. There is ground



How these 18 Experts can help you

Get into a High Pay ACCOUNTING CAREER

LaSalle's famous staff of Accounting authorities are helping thousands prepare for fast promotions and bigger pay. They can do the same for you!

If your heart is set on a larger income and all that it means . . . better home—fine car—larger bank account—more of the good things of life. . . .

If that's your ambition and you are really serious about it, then you owe it to yourself to get the REAL FACTS about Accountancy, and the many good-pay opportunities that can be YOURS through LaSalle's famous Problem Method plan.

It matters not whether you've had a single day of experience in this field—or whether you have already started but want to climb higher. LaSalle's expert training is designed to take you from where you are . . . to where you want to be . . . in higher positions and a lifetime career of security and good income.

WHY YOU CAN'T FAIL TO GAIN

You see on this page a panel of experts who know Accounting from A to Z . . . all the way from simple bookkeeping, on up through advanced accounting, cost accounting, auditing, income tax, and coaching for the C.P.A. degree. These are only part of LaSalle's instruction staff. But what is most important to you . . .

. . . These C.P.A. experts know how to impart their knowledge to others . . . how to help you prepare quickly yet thoroughly for success in this very lucrative field.

The proof? What stronger proof could there

be than more than 4,000 Certified Public Accountants (approximately 10% of the U.S. total) who have trained with LaSalle? Or the hundreds of thousands of men and women whom LaSalle has helped qualify rapidly for more money, a brighter future, in a high-pay-lifetime career? These thousands came to us with different backgrounds of experience and varying degrees of ambition. Many have reported raises and promotions after only a few weeks of training. Thousands of them have written to say they are now earning 50% more—even *double* their former incomes—often in less than a year. These letters are published in book form for your inspection. They were written by real people, with real income, problems and ambitions—people who might be your next-door neighbor.

Yes, if you are really sincere in wanting to better your position—start your income climbing—enjoy a lifetime career of high standing and high reward—this friendly staff of experts can help you.

SAMPLE LESSON SENT FREE MAIL COUPON BELOW

You don't have to wonder what LaSalle's Accountancy plan is like. You will be sent a free sample lesson, which does not obligate you in any way. Study it—keep it—see for yourself how simple, clear, and easy it is to master. This is an actual lesson right out of the regular training—to show you exactly how LaSalle's Problem Method has trained more than 1,300,000 men and women from all walks of life.

Also . . . the 48-page book, "Accountancy, the Profession That Pays," gives all the latest facts about the new and growing opportunities in five different fields of profitable employment.

This can be an important day in your life. A coupon like the one below has started hundreds of thousands of men and women toward a bigger job, a larger income. It can do the same for you.

FREE 48-PAGE
CATALOG

Mail the Coupon Today!

LA SALLE

EXTENSION UNIVERSITY

A Correspondence Institution

417 S. Dearborn St., Dept. 1283H, Chicago 5, Ill.

Send free Sample Lesson in Accounting—also, 48-page free book, "Accountancy, the Profession That Pays" . . . all without cost or obligation.

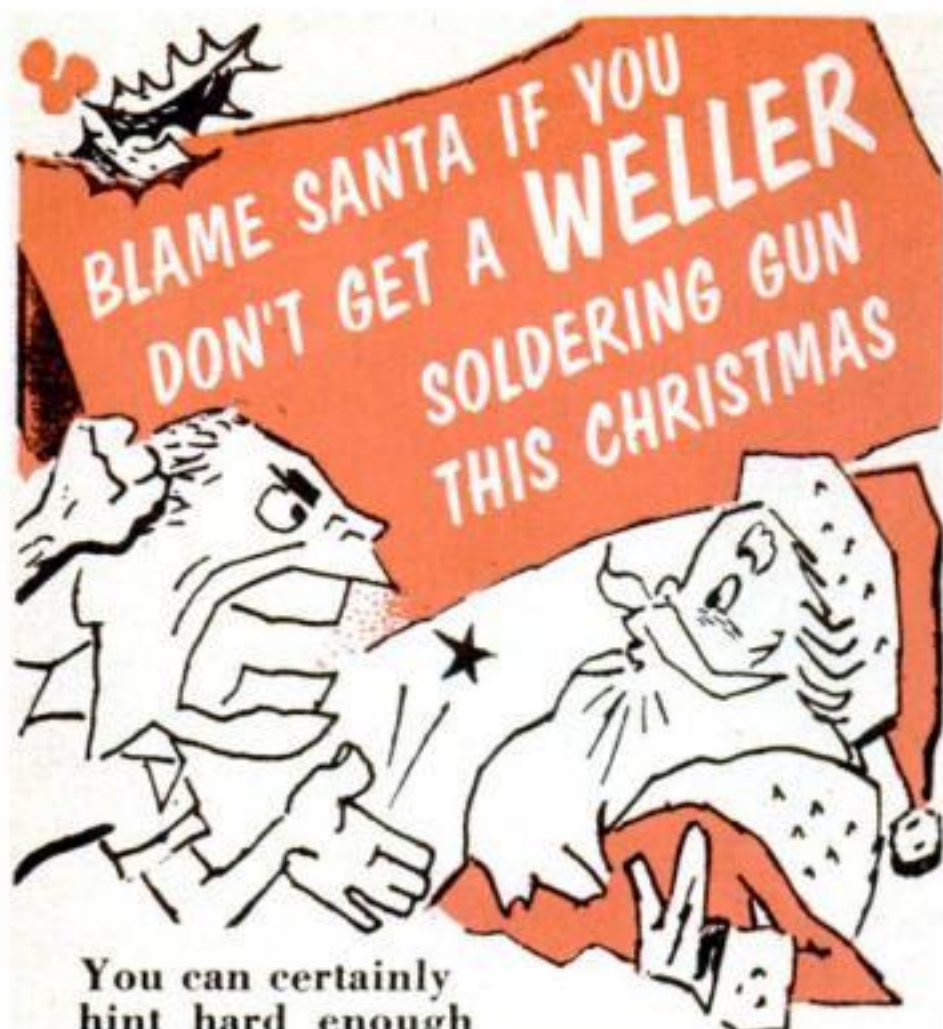
Name Age

Address

City & Zone State

FREE SAMPLE
LESSON





You can certainly hint hard enough telling everybody a Weller Soldering Gun tops your "want" list because it makes all kinds of homecraft and hobby jobs easier, faster and better. So if you don't get one, it's because the old guy kept it for sled repairs and his toy factory. Even at the North Pole, there are endless uses for the *new* Weller Soldering Guns!

While you're thinking about it... they're gift wrapped for Christmas and a sure-fire idea for giving, too!

INSTANT HEAT—saves time and current
2 SPOTLIGHTS—eliminate shadows
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water in all soil, and there is a water table at some depth almost everywhere.

Divining rods seem to be attracted to the bases of large trees, to large piles of rock, brick, concrete blocks, etc. I do not know what they point to, but I am sure that they point.

JOHN C. LEE, Terrace Park, Ohio.

A neighbor of mine once solicited the services of the local "water diviner," an old-timer who had quite a reputation, and let himself in for drilling a whole series of wells.

The first three wells all dried up within a couple of years after drilling. Finally he tried a fourth, locating it where the water diviner suggested—an inconvenient 220 yards from the house. The drillers went down 129 feet and obtained an extremely strong vein of sulfur, which is still producing very well after 22 years!

CAPT. HAROLD E. WELLS,
 Eglin Air Force Base, Fla.

If any person has any doubts about its being magnetism that causes the forked stick to turn down when and where it does, I would ask him to get a good green forked stick (willow or peach is good) and a dip needle, try them out side by side, and be convinced of the truth.

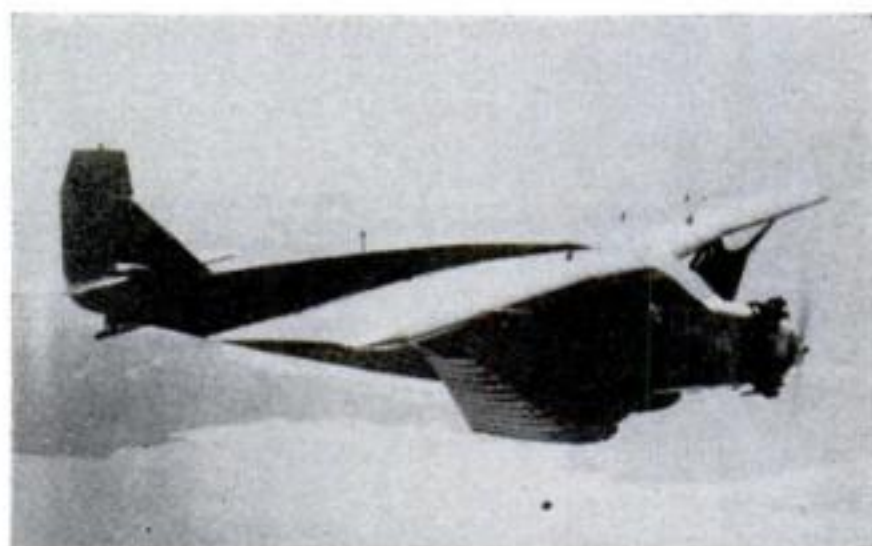
LUCIAN L. GUNN, Hardy, Neb.

"New" Wing Really Rather Old

That French airplane with the long, narrow "new" wing that you showed us in your July issue [p. 69] isn't so new, if my memory's right. The Bellanca Air-Cruiser had one like it many years ago.

JIM BARRETT, Kansas City, Kan.

So it did, and here's a picture of that pioneering Bellanca Air-Cruiser in flight in



1927, the year it was designed and built. Note that it also had a retractable landing gear, which a lot of people had talked about

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Aubrey B. Martin,
Wheeling W. Va.

"Received our accordion today—we are pleased with such a wonderful instrument. I have talked to my neighbor who taught accordion for 20 years and he praised this accordion highly as a wonderful instrument."

Theodore M. Swiateck
Denver, Colorado

"I am writing you from my studio and enclosing a check for down payment on my accordion which I am very pleased with indeed! I thank you for your very generous trade-in allowance on my old accordion. Thank you also for your very courteous letters."

"I like the way you do business—trigger action and so courteous."

Bill Balduzzi,
Terre Haute, Ind.

"My accordion arrived yesterday and am thrilled and happy over the beautiful instrument and pleased with the tone it gives. It is all that you said it was and more."

Mrs. Fred Richter,
Clear Lake, Wis.

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but no one had tried out commercially until then.

They Swap Tape Recordings

I wonder if your readers have heard of the new hobby called "tape-responsence," the exchange of tape-recorded letters. Many



people today are finding pleasure in swapping all sorts of tape recordings—such as radio programs and music—with others all over the world.

They even have a club—Tape-Respondents, International. It was formed by Fred Goetz, 3488 22nd St., San Francisco, who took up the pastime in 1948 and has since exchanged well over 1,400 wires and tapes with fellow hobbyists.

DON LEY, Dunkirk, N. Y.

Club for Parakeet Fans?

Thanks for the wonderful article and pictures on breeding parakeets [Oct., p. 140]. Some friends and I promptly bought a few birds. They are 90-percent finger-trained and amuse us with their silly tricks.

I think Wilbur Crane and Alan Hinton should start a club for parakeet fans. Seems to me there must be thousands of owners of the birds who would be glad to join for a small monthly or yearly fee and get a ready source of answers to questions that might come up about their pets.

LOUIS HABER, Bronx, N. Y.

Rear-Engine Cars in Snow

The man from Vancouver who recently wrote you that "until light-alloy engines are produced equaling today's standards, the rear-engine family car is only a dream" has provoked me to add my nickel's worth to the running argument on this subject. I can only wonder whether he has ever driven a rear-engine car.

Right now I own two, and I can say with conviction that in a country like mine (and the Vancouver man's), where there is plenty of snow, the rear-engine car really comes into its own. It will not take any great tech-



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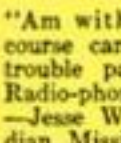


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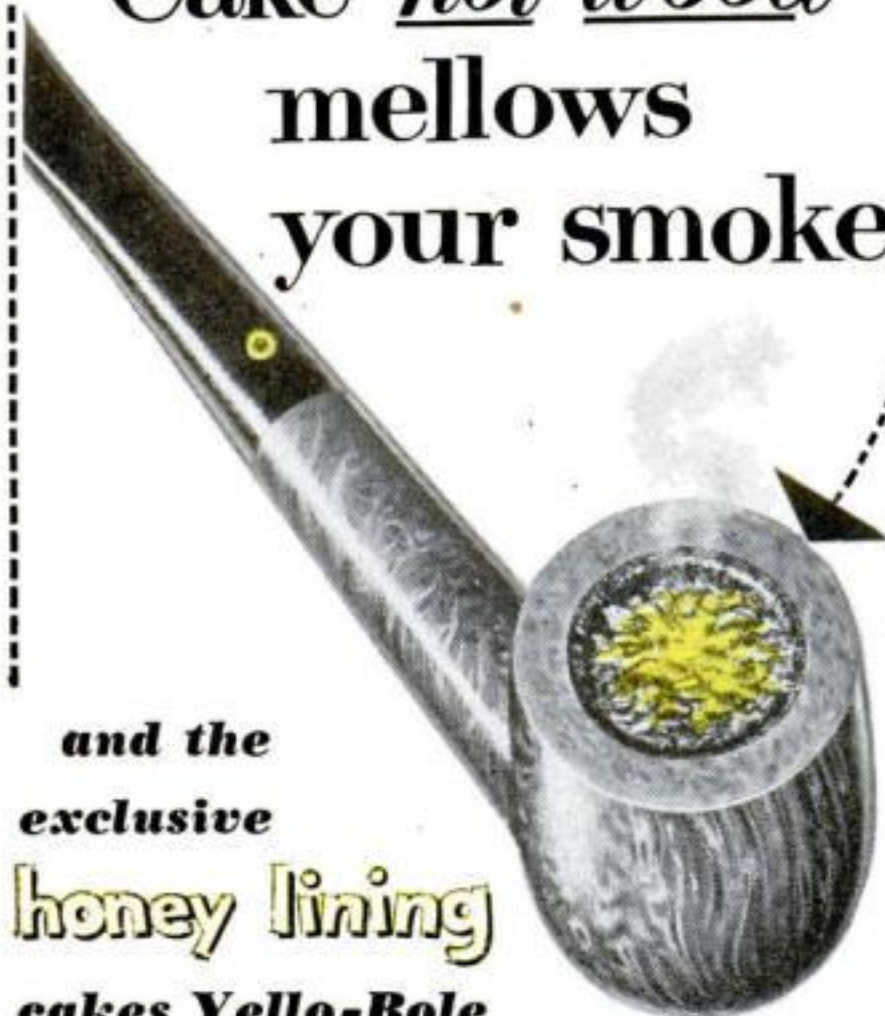
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nical knowledge to see the advantage of heavily loaded rear wheels pushing lightly loaded front wheels in snow.

G. W. WHITE, Severn Park, Ont.

Cobb Beat Them All

The men in our company of medics have been having a little argument over racing cars. I say that there is one that has made 1,000 miles an hour. Am I right?

PVT. VINCENT D'ANTON,
APO 6, San Francisco.

No, not by quite a few miles an hour. The world's absolute speed record for automobiles is 394.196 m.p.h. John R. Cobb set it in a Railton Special on the Bonneville, Utah, salt flats on Sept. 16, 1947.

Rewards of Letter Writing

Your magazine must be read throughout this whole wide world. Last spring, after you had put out an especially good issue about cars, I wrote and told you how much I'd enjoyed it.

You printed my letter in April, and since then I've heard from a cousin I had lost



track of and from a fellow car enthusiast way down in Australia.

WALLY BENEFIEL, Medicine Lodge, Kan.

Right Slant on Engines

I enjoyed your article about hot-rod railsters—"I Ain't Got No Body," July, p. 122—very much. But there is one thing I don't understand. You state that "some engines slant toward the rear for traction." I don't see why slanting the engine would give it more traction.

DONN MOORE, Oak Harbor, Ohio.

There is a slight power loss at the universal joints in any car, due to the angular displacement as the propeller shaft revolves. This displacement can be reduced if the engine is cocked higher in front.

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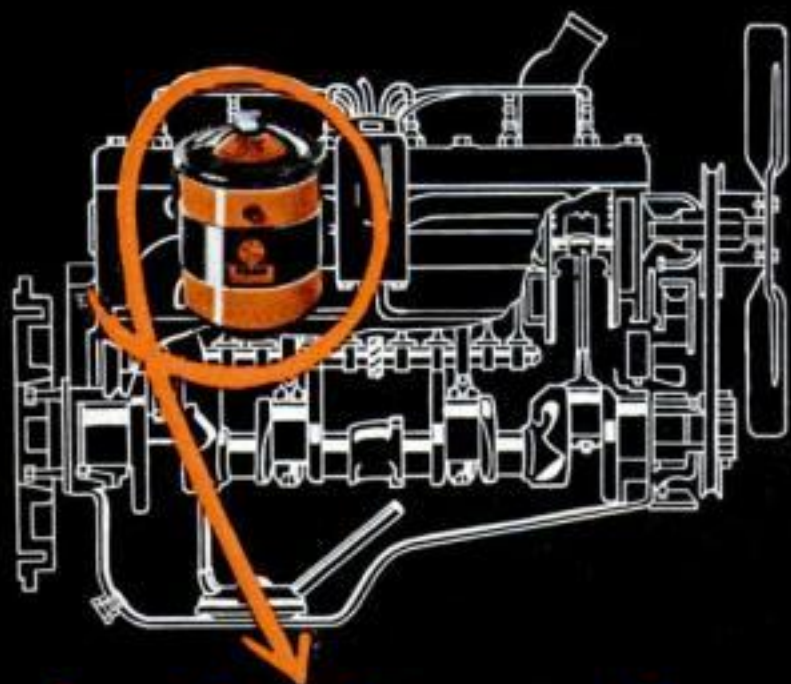
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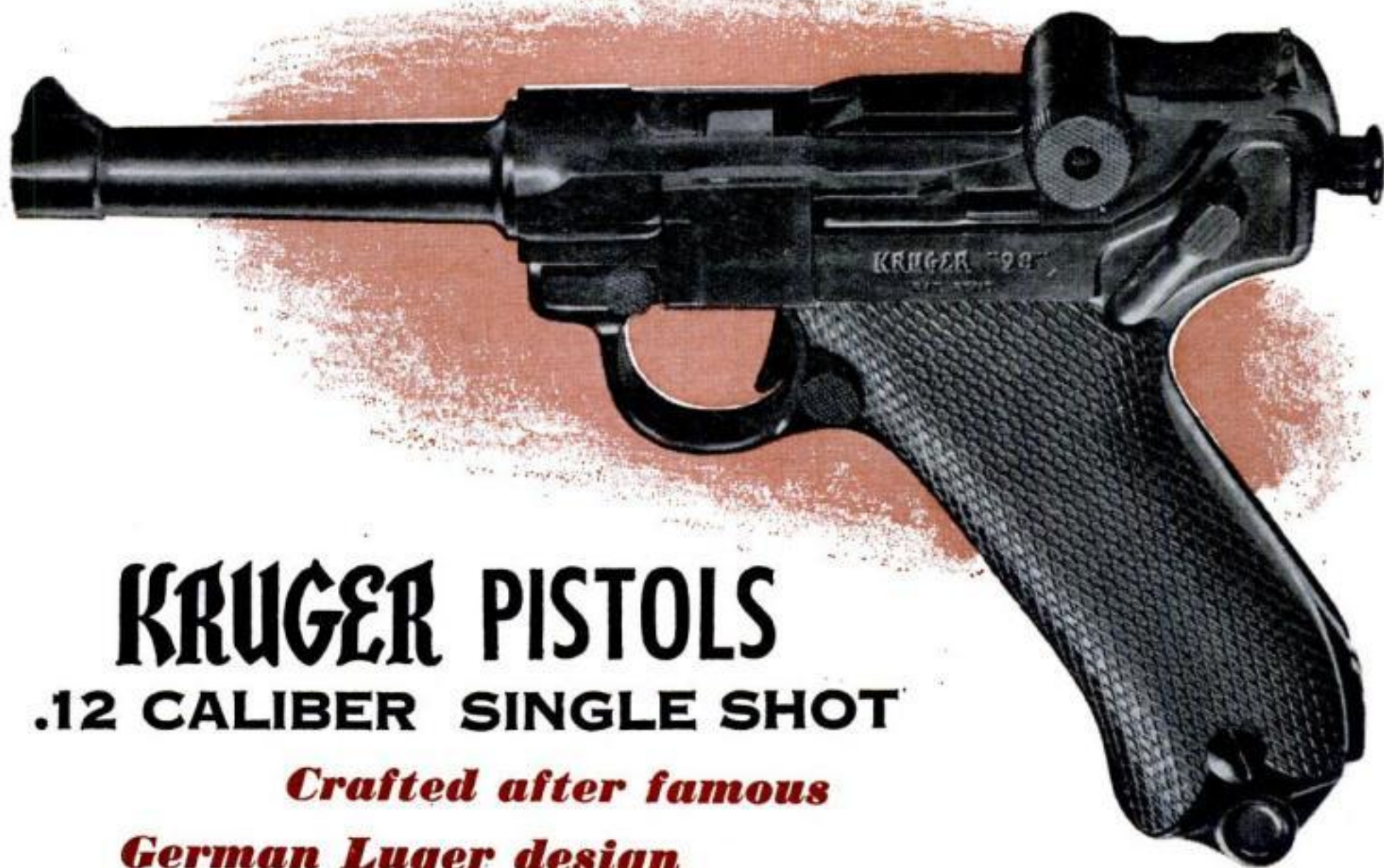


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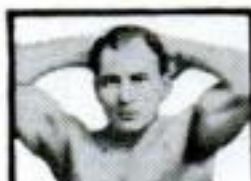
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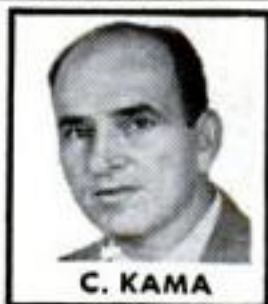
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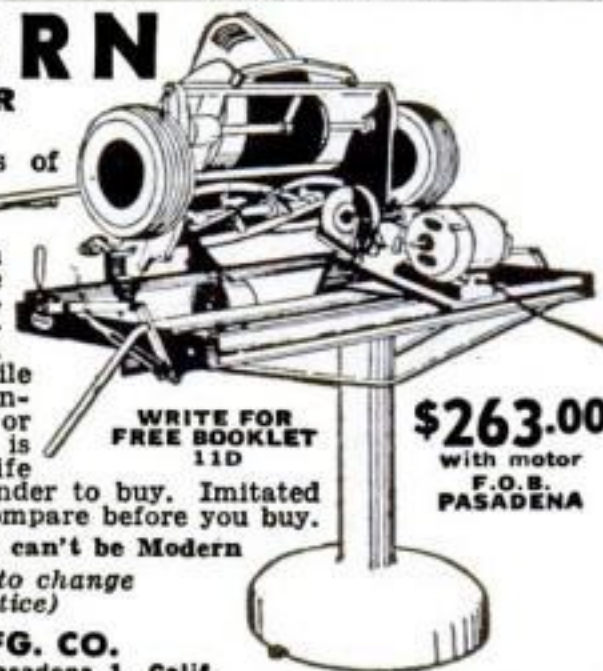
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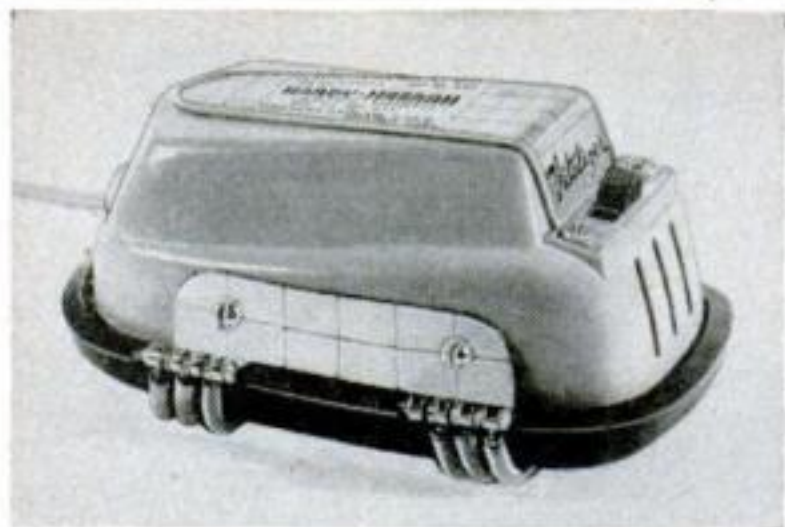
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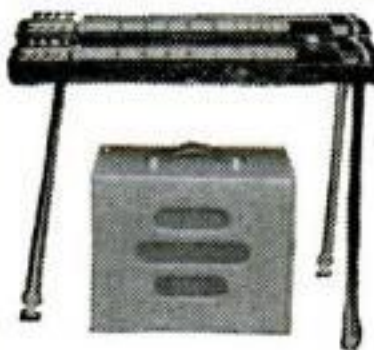


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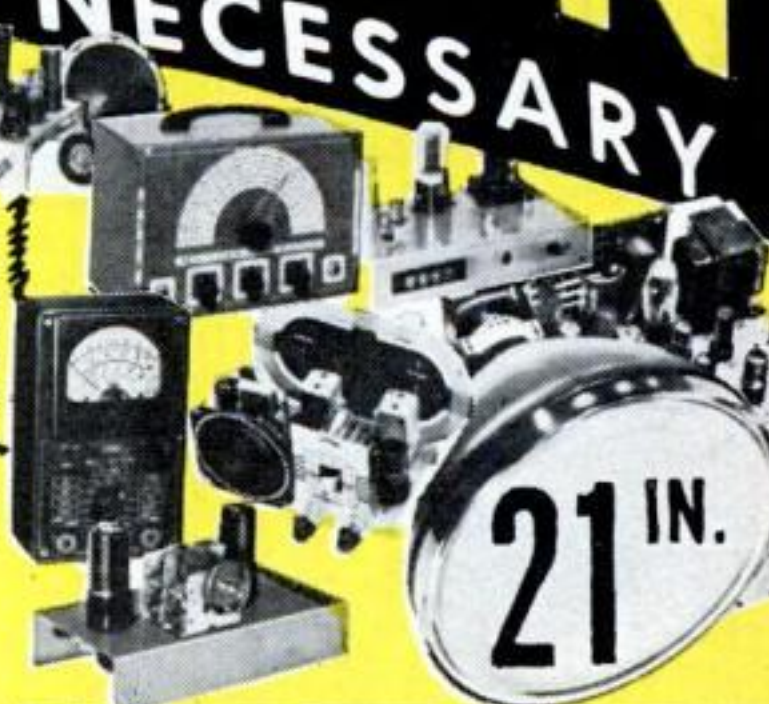


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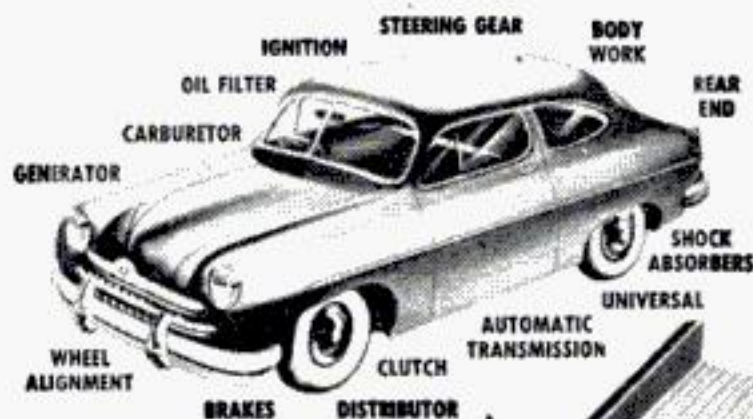


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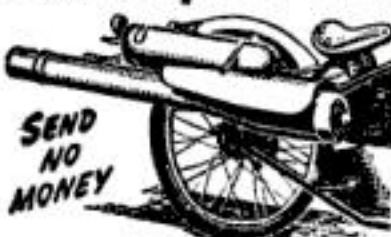
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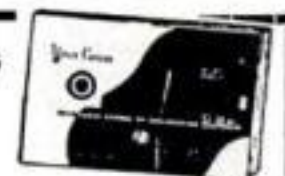


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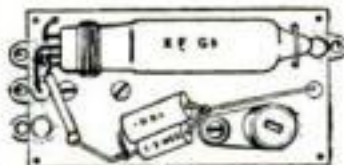


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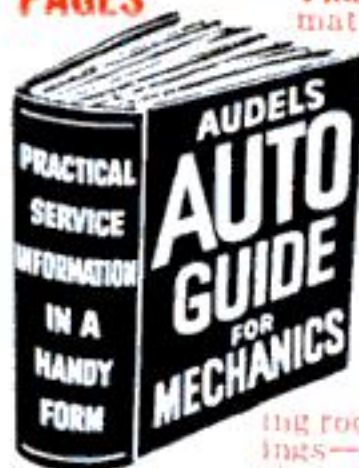
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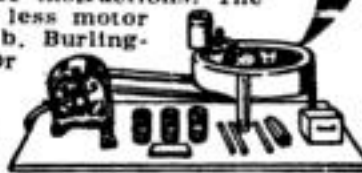
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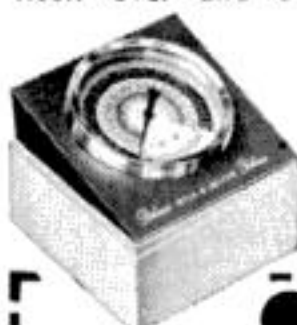
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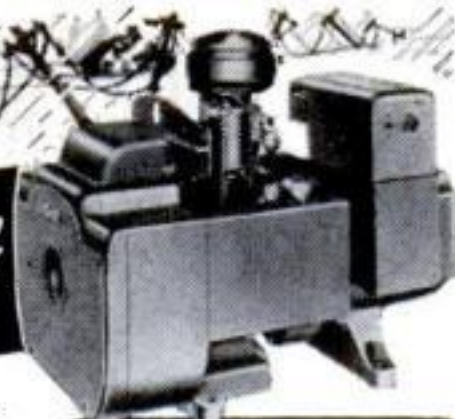
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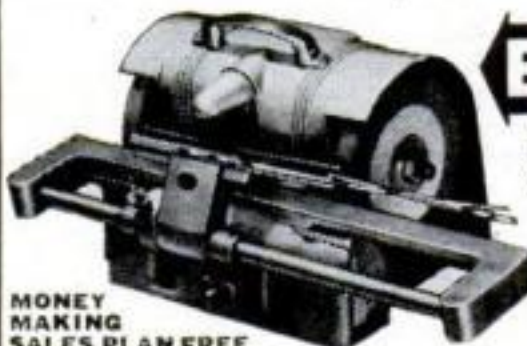


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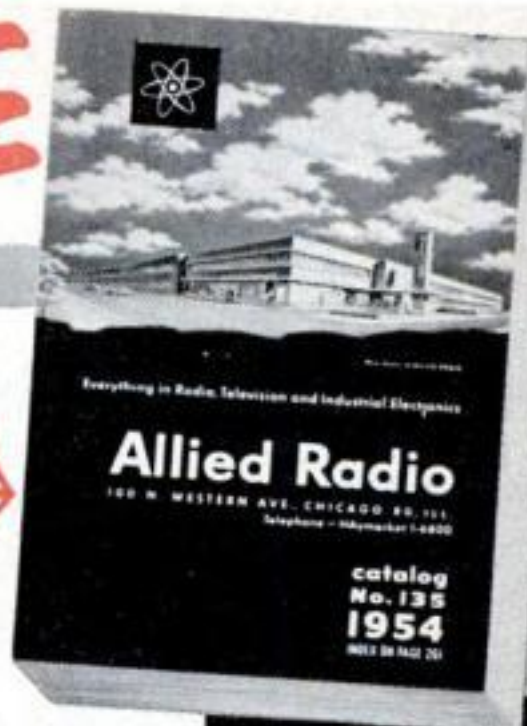
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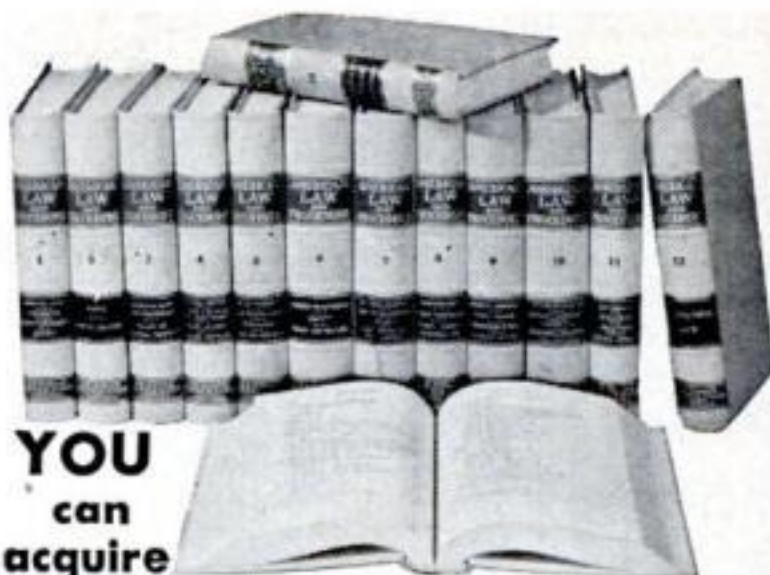
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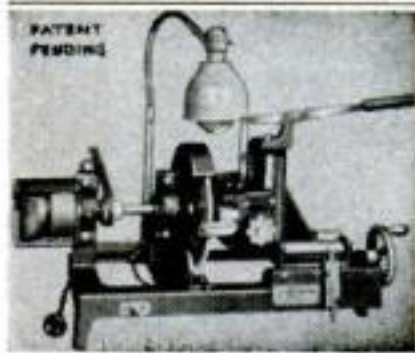
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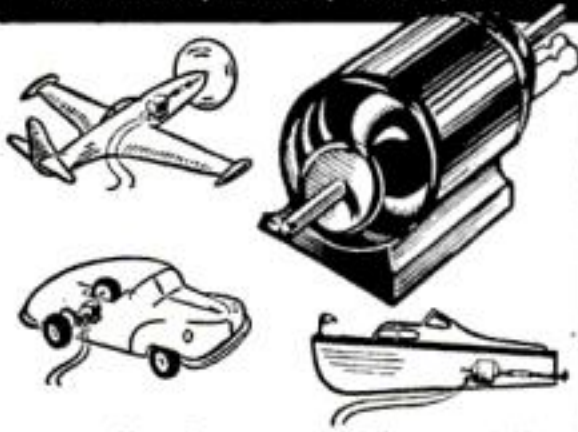
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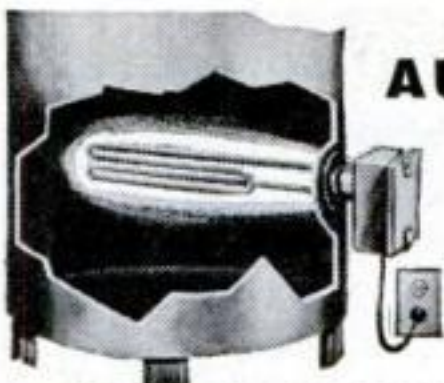
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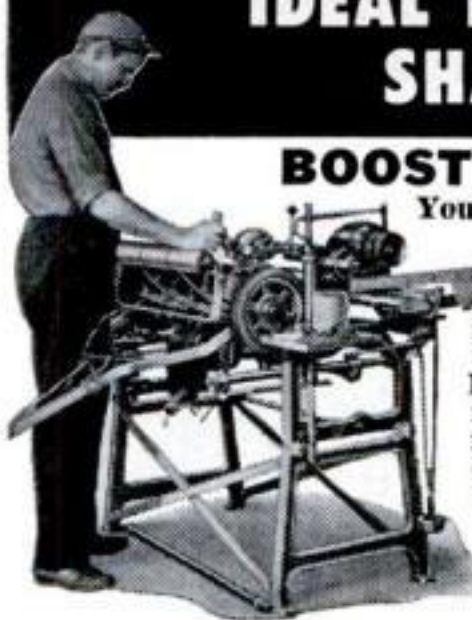
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VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page Catalog Free! Parkway Machine Corporation, Dept. 73, 715 Ensor St., Baltimore 2, Maryland.

MAKE Money spare or full time, casting Metal Toys and Novelties. Big wholesale and chain store demand for Autos, Soldiers, Ashtrays, Banks, etc. keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. E, 1696 Boston Road, New York 60, N. Y.

TROPICAL Fish supplies. Save! Representative your area will supply. Nmoae, Box 4635, Los Angeles 24, California.

EARN Money Selling Binoculars, Rifles, Cameras. Send for free dealer bulletin. Nidorg & Co., 14-E Washington Place, New York 3, N. Y.

RECAST old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

LIVING miniature ("Ming") trees only 10 to 20 inches tall. Grow at Home. Big Profits! Spare time opportunity. Fascinating! Amazing! Write for Free Seed and Plan. National Nursery, Dept. CG, Inglewood 4, California.

BREED Rare Tropical Fish at home. Earn Big Money! Learn Secrets! Help fill huge demand. Amazing Opportunity! Free Plan. Tropicals, 1008-G Los Angeles St., Los Angeles 15.

RAISE Orchids—at home—big profits—fascinating. Year 'round any climate. No Greenhouse. Instructions. Including Blooming-size Orchid Plant, sent for no-risk examination. Free details. Flowerland, 4622-F Wilshire, Los Angeles 5.

LEARN metalizing baby shoes, gifts, etc. Bronze, gold, silver. Folio Free. Kik-tavi, 7217-PS South Broadway, Los Angeles 3.

"MAKE Perfume" Catalogue Free—"International." 6347 Parnell-PS-12, Chicago 21, Illinois.

FIX typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 4, Tarentum, Penna.

\$25 WEEKLY working two hours daily at home. Lycke, Box 2471-B, Cleveland 12, Ohio.

NATURAL Molding Latex. Extra Thick. Free Sample. Flock, Tinsel, Supplies, W. Wooley, 115-B Donald, Peoria, Illinois.

MAKE Money At Home as renewal headquarters for all magazines. Big Christmas sales profits now. Liberal Commissions. Supplies furnished. Write for Free Catalog. McGregor Magazine Agency, Dept. 510B, Mount Morris, Illinois.

MAKE Money selling by mail; instructive booklet 25c. Manhattan House, P. O. Box 51-L, Saint Albans 12, N. Y.

QUICK Money! "Repairing Car Batteries." At Home! Easy, Too! Batteryman, Grand Junction, Colorado.

OPERATE profitable spare-time "Home Letter Shop" by mail. Write. Continental Publishers, 1332 So. 61st, Milwaukee 14, Wisconsin.

POPCORN and Potato Chip equipment. Long Eakins Company, 5363 High, Springfield 99, Ohio.

GET Dollars by Mail! Keep every Penny. Terrill, Bogard, Missouri.

BOOKKEEPERS—Earn more money. Operate amazing "No-Ledger" system. Spare or full time. Free bulletin. Write Frye, Box 432, Chester, South Carolina.

EARN Money Selling Jewelry & Home Appliances. Send for Free Wholesale Catalogue. Nidorg & Co., 14-L Washington Place, New York 3, N. Y.

HOW to Raise Needed Funds. Free details. Enterprise Bureau, Syracuse 2-S, New York.

HOW and where to obtain Capital? Free details. Star Service, Wapakoneta, Ohio.

INDUSTRIALISTS - Businessmen. Investigate Florida. Rapidly-growing Florida offers innumerable opportunities for business and large and small industries and a highly favorable tax situation. Write State of Florida, telling type of business you're seeking and specific requirements. You'll be put in touch with communities where opportunities exist and where you'll enjoy Florida's wonderful year-round climate. Free, complete information will be sent you. Write today: State Of Florida, Industrial Development Division, 4315B Caldwell Building, Tallahassee, Florida.

EARN Extra Money weekly mailing circulars for advertisers. Complete instructions—25c. Siwaslian, 4317-B Gleane Street, Elmhurst 73, New York.

"INCOME" from local information. No Selling. Write Neherco, LaVerne 6, Calif.

EARN Money With Typewriter—Sewing Machine. Details Free. Edwards, 3915-PS, 12th, Des Moines 13, Iowa.

ADVERTISING book matches—Cash in on big demand—sell Union Label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. PX-1253, 7530 Greenwood, Chicago.

SUNNY California Land Bargains as low as \$5.00 per acre. Low Down payments—low monthly payments. Write for free information. Land Department, Suite 105, 1540 N. Highland Ave., Hollywood 28, Calif.

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

LEARN Sewing Machine Repair, electricity, sell "How" to make big money at home spare time. New zigzag machines, etc., wholesale. Details free. Taylor Service, Hamilton, Ohio.

START A Buying Service. buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers, 627-S Linden, Buffalo, N. Y.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys, Kenmore 23-T, New York.

BUY Wholesale nationally advertised appliances, watches, etc. 1300 items for Christmas Catalogue 50c. International Sales Company, Dept. B, 175 Fifth Ave., New York 10, N. Y.

THRILLING Profitable Home Business. Make fast-seller chenille monkey trees, dolls, flowers. Terrific holiday demand. Information free. Velva, Bohemia 17, N. Y.

MONEY in new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. S. Ray Co., 3605 South 15 Ave., Minneapolis 7, Minn.

BRONZED baby shoe metalizing equipment. New and used. Big selection of metal and onyx mountings. Free catalogue. Hollywood Bronze Supply, 1624-A E. First Street, Los Angeles 33, California.

EARN \$50 weekly in spare time. Lifetime vitamin business. Details free! Emm-Bee, Dept. PS2, Box 992, New York 8, N. Y.

BOOKKEEPERS, increase earnings operating sensational bookkeeping service. Kern, 4942-B Vineland, No. Hollywood, Calif.

WE Love our mailman—He leaves over \$1,000.00 monthly in our rural mailbox. My college professor husband drafted a scientific home mailorder method. We bought a Texas ranch, live as we always wanted. Now we sell the "Ranch Mailorder Method." Operates anywhere. Inquire: Eveningshade Ranch, Helotes, Texas.

WANTED! Home Producers, by manufacturers in our Clearing House Service. Become a subcontractor, casting plastic products for these companies. Thousands of easy-to-make items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 12-PS, East Boston 28, Mass.

BE Notary Public. Rate higher. Details Free. Stationers, Helotes, Texas.

FREE details! Home operated mailorder business. Successful "Beginner's" plan. Everything supplied. Lynn, 10420-C National, Los Angeles 34, California.

GET A New Start In Life In Collection Business. Free Details. Franklin Credit, Roanoke 7, Virginia.

HOW To Start A Mail Order Business (And Keep it Going). Details. Jorine, Snyders Lake, Troy, New York.

MAIL Post Cards At Home. Everything furnished. Keep all money—Orders Filled Free. Rush name: Schipper, 121-P Wilkins, Rochester 21, New York.

ONE man contracting business. \$1.00 investment. Free literature. McComb & Son, Hometown, Indiana.

MERCHANDISING with post cards! Details free, write, Simmons, 88 Weaver, Buffalo 6, New York.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior E E5, Wisconsin.

MAKE Rubber Stamps, repair dolls, learn invisible reweaving. Molding Latex. Catalogue of "60 Ideas." Universal, Box 1076-B, Peoria, Illinois.

NEW Exceptionally profitable plans, ideas for home operated mail business. Rush name. Miller, 1772-R Carlyon Road, East Cleveland 12, Ohio.

LIQUID Rubber, make flexible molds. Free Sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

WHAT'S Your Field Of Interest? Whatever it is, specialized magazines will help you to greater success. Look over current copies of those covering your field through our Easy-to-Get-Acquainted service. Choose from 4,387 publications covering all fields—business vocational, agricultural, sports, hobbies, etc. Write for current list. It's free. Commercial Engraving Publishing Company, 34S North Ritter, Indianapolis 19, Indiana.

MEN Wanted introducing regulators. Secret electromechanical formula stops generator regulator and battery trouble. Few spare hours make \$25.00, full time \$1,000.00 monthly. Write how to start and get demonstrator free. Scientific Electric Co., Box 2162PC, Cleveland 8, Ohio.

POPULAR SCIENCE OPPORTUNITIES

\$1000 A Week Possible With Great Triple Profit Plan. Edikara, Johnstown, Penna.

OPERATE profitable mailorder business. Splendid opportunity. For details write Harrison, Box 23, Bellflower, Calif.

EARN \$2600 more a year from hour each evening at home laundering venetian blinds. Others making over \$10,000 working full time! New Portable machine. Free booklet. R. X. Co., 442 N. Seneca, Wichita 12, Kansas.

MAKE flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tooker, 630-A Chestnut, Hamilton, Ohio.

OPERATE "Escalator" Mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco, Decatur 175, Ill.

MAKE Money at home mailing literature offering fast selling books and merchandise. Everything supplied at low cost. Rush name. Thomas Jerdon, Hermansville, Maryland.

BUY Wholesale thousands nationally advertised products. Save money! Make Money! Postcard brings details. Kemah Company, 5017-E Washington, Houston, Texas.

MEXICAN Feather Bird Pictures 200% Profit your own business. Sample Offer Beautiful picture with hand carved cedar frame and glass \$2.50 Value, only \$1.00 Postpaid. Free Details. Specialty Products, Co., 302 New Market Ave., South Plainfield, New Jersey.

EARTHWORMS: Health and profits. Details 25c. Earthworm Gardens, Dept. PS12, Box 428, El Monte, Calif.

ELECTRO-plating. Profitable home business. Autoparts, mirrors, novelties, giftwares, baby shoes. Easy, inexpensive home processes. Free booklet. Tyco Metals, Box 13231-CP, Houston 19, Texas.

LEARN Piano Tuning quickly at home. Make big money—tremendous field! Amazingly easy. Free information. Empire School of Piano Tuning, Champaign 1, Ill.

50 MAIL Order Plans full or Spare time catalog free your name address. Lindholm Service, Box 2504, St. Ann Station, Minneapolis, Minnesota.

EARN amazing profits by following our instructions; selling nationally advertised watches, etc. Enclose 25c. refundable. Receive multi-colored salesman's catalog and confidential price list. Result Sales D, 580 Fifth Ave., New York.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries, Grand Rapids, "Minnesota."

MAKE Perfumes And Cosmetics At Home. write "Carey Laboratories," 1914 Chouteau, PS-12, St. Louis 3, Missouri.

EARN \$15,000-\$30,000 annually. Franchise protected. Guaranteed minimum \$12,500 or money back. Live at home. No merchandise to buy. Self-employed. One of most exclusive and noncompetitive businesses in United States and Canada. Send 50c for explanatory book. Money refunded when book returned. Harrell & Company, Box A-2, Louisville, Illinois.

BUILD luggage and cases at home. We sell your product. No special tools or equipment needed. Free details. Cascraft, 805-X Sunset Blvd., Los Angeles 12.

PLEASANT Spare Time Work. Write RTK, Box 6693-C, Cleveland 1, Ohio.

PACKAGED food mailorder business. Home operated. Everything supplied. Successful proven plan. Free details. Frazar Foods, Desert Springs 11, California.

WHAT must I do? Read "Success Today" and "Success Poison". \$1.00 postpaid. Merrell Quinn, P. O. Box 967, Little Rock, Arkansas.

GROW plants, flowers. Details free. Shiffers, Box 129, Millersburg, Penna.

MAKE Money mailing cards; circulars. Pleasant; Profitable. Paton, Box 55-A, New York 23, N. Y.

EARN money at home, making rhinestone jewelry. Free catalog. Ebert, Box B183, East Orange, New Jersey.

FREE Folder—"Make Big Money by mail The Sure Way That Pays". New-different. Fullmer, 92J Greenwood, Pocatello, Idaho.

DO Mailing At Home—Get Orders In Every Mail. Keep Every Cent. Everything Furnished. Genmerco, Box 142-N, Dorchester 24, Mass.

HAVE Home Mail Business—Get \$10 Orders In Every Mail—Keep \$8.00. Everything Furnished. Hutchinson, 401C Adams, Dorchester 22, Mass.

WILL establish you in business with our capital. Part-time or full time. No investment or experience needed to start. Winona Monument Co., Winona, Minn.

MAKE Profitable Products — Formula Catalogue Free. "Imasco", 6347 Parnell-PS-12, Chicago 21, Illinois.

CONVERT hand mowers to power mowers. Do it now, this winter. Sell the Handy-Dandy conversion kits. Easily installed on 16 to 20" mower. Use any small gasoline or electric motor. Quick delivery. Kits purchased with or without engines. Also new garden cultivator. Takes less than a minute to change attachments: Weed Whacker, Lawn mower, Snow plow, and Rotary tiller. Discount to dealers. Le Claire Manufacturing Company, Le Claire, Dept. P.S., Iowa.

EARN money! Amazing plans! Easily mastered at home. Details free. Bruns, 216-E West Jackson Blvd., Chicago 6, Ill.

START a lettershop on a shoestring! Sales \$56,000. Started \$36.00. Information? Wells, Box 13, Basking Ridge, New Jersey.

FREE! Unequaled, big profits, home mailorder details. Mailord, PS-12, Southampton, New York.

PROFIT! Without Investment!! Through our Watch-Clock-Jewelry-Camera-Pencil Repair Service. Inquire Modern Technical Supply, 55-PS West 42nd Street, New York 36.

WOMEN! Make Big Money at home. Sew ties for us. It's fun. Earn \$10 day easy. No selling, no experience, no machine necessary. We supply everything. Help us fill huge demand. Exciting details free. Fashion Ties, 2521-X, Manchester, Inglewood 4, California.

\$100.00 WEEK—Preparing Income Taxes. Box 1343, Port Arthur, Texas.

UNUSUAL homework opportunity. Spinning Angora Sparetime, Men, Women. Angora House, PSM, Springfield, Illinois.

\$2,000. MONTHLY—Easy. Instructions Free. Sundbergs, 1552 Essex, Willow Run, Michigan.

NATURAL semi-transparent wood. Light shines right through it, richly illuminating the lovely grain. Make unusual items that sell on sight. Generous sample \$1.00, postpaid. Opaque Woods, Box 1038, Wildwood, Florida.

3,658 GOVERNMENT-owned inventions available to anybody for free use. Details, 25c. Box 122, Allenhurst, New Jersey.

SILICONE—Make and apply invisible masonry water repellent for cinder block, asbestos siding or any porous surface. Sample and instructions \$1.00. Printech, Box 384, Princeton, New Jersey.

UP To \$10,000 Yearly! New, Exclusive, Mail Order Program! Participation limited. Rush 3c stamp for further details. Pacific Advertisers, Box 4097-W, San Diego 4, California.

START your own profitable home mailorder business! We supply everything! Write today! Studio Products, Box 564-"D", Glendale 5, California.

\$15.00 THOUSAND Possible — highest prices compiling mailing lists and addressing from them; longhand, typewriter. Particulars free. Almon Torrey, Rowley, Mass.

\$250 WEEK reported! Free book "505 Odd, Successful Businesses." Work home! Expect something Odd! Pacific-36C, Oceanside, California.

EARN \$2.00 Hour! I do—making Sandals. Youngs, 1308-PS South First, Arcadia, California.

JOIN "Money Getter's Guild"; get monthly magazine; money making tips; benefits; discounts. 12 months \$1.00—Sample 10c. Costar, G.P.O. 972, New York 1.

BUY it wholesale. Manufacturers. Distributors. Over 850,000 items. Literature free. Olsen, 1231-B East Third St., Duluth 5, Minnesota.

BE appointed Notary Public. Details free. Magnolia Press, Box 1272-S, Burbank, Calif.

\$46 FROM Square Foot Plywood; Jigsaw necessary. Write: Woodart, Bridgewater, Mass.

MAIL Order Business. Money making opportunity. No inventory. Beverlyhouse, 5460-E Beverly, Los Angeles 22, Calif.

MOLD Making Liquid Rubber; sample pint, with instructions, \$2.00 postpaid; Plastercraft Supply Company, 3051 St. Clair Ave., Cleveland 14, Ohio.

SET and sharpen circle saws in minutes without equipment. "Pilmstreet" files and hack saws to cut more, reducing cost 300%; year's supply; both \$1. Hovsman's Hobby, 3503-3 Chestnut, Baltimore 11, Md.

\$500,000 BY mail from home. Free Folder. Publicity, Kalamazoo 65EC, Mich.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as \$8.00, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising". O. K. Kelly, Classified Adv. Mgr., Dept. 1253, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

38 MONEYMAKING OPPORTUNITIES

SELL Titania gems; \$9.75 carat wholesale. More brilliant than Diamonds. Free catalogue. Diamonite, 1404-S Mitchell, Oakland 1, Calif.

SPARETIME Profits Taking Subscriptions. All Magazines. Wholesale Catalog Free. Cassell Agency, Westfield 1, N. J.

DETECTIVES Earn Big Money. Experience unnecessary. Detective Particulars free. Wagoner, P-125 West 86th, N. Y. 24.

MAILORDER—Operate profitable home business using Free Advertising Method reaching millions. Revealing information free. H. G. Seidel, 7070 Hollywood Blvd., Hollywood 28, California.

SCHOOL Seniors—Sell Classmates America's most beautiful Graduation Name Cards. Largest selection. Highest commission. Outsell all others. Free sample kit. Printcraft, Dept P, 1509 Maple St., Scranton 5, Penna.

MAKE Money addressing Envelopes! Our information reveals how. Only 30c. Business, Dept. 45-M, P. O. Box 2224, St. Louis, Missouri.

MAKE Money—At home by mail. Fast, Easy. Liebig Industries, Beaver Dam 2, Wisconsin.

\$10,800 PROFITS! Your Own Mailorder Business! No risk! "Success Plan" Free! Treasury, 709 Webster, New Rochelle PS-13, New York.

101 WAYS To Make \$1,000 At Home. Details free. Business Surveys, 365 So. Fairfax, Los Angeles 51, California.

MAKE \$2600 a Year Spending 5 Hours A Week. Start At Home. New Machine. Small Investment. Free Booklet, A. Z. Co., 442 N. Seneca, Wichita 12, Kansas.

GET Facts—\$4.00 merchandise, \$2.00 treatise 100 money makers. \$6.00 value \$2.00. Kahn, 506 West 45th, Chicago 9.

ROSARIES—Make Your Own! For gifts—fun—profit! See complete line of religious goods—gold filled and sterling rosary parts, Medals, books, statues, novelties. Big group of make-it-yourself items. Send 10c for New Wholesale Illustrated Catalogue—just off the press, bigger than ever! Greylock Creations, Box 1048-PS, Pittsfield, Mass.

HOW To Earn Up To \$500. for each Script, writing for Television. New, Different! Particulars Free! Wonderful Products, Box 2113-A, Santa Fe, N. M.

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

POPULAR SCIENCE OPPORTUNITIES

GET \$10.00 by Mail: Keep \$8. Terrill, Bogard 2, Mo.

\$35 WEEKLY addressing envelopes. Instructions \$1. refundable. Adservice, Spring Valley 36, New York.

ALUMINUM awnings baked enamel colors factory prices. Write All Weather Comfort, Box 10254, Tampa, Florida.

TRIM Hair Without "Barber." Miracle clipper sells on sight. Keeps hair neat. Samples sent on trial. Kristee 181, Akron, Ohio.

START A Buying Service. buy wholesale thousands nationally advertised products. Make big profits selling at sizeable discounts. Postcard brings details. American Buyers, 630-S Linden, Buffalo, N. Y.

OPERATE profitable mailorder business write for details. N. J. Bode, 223 So. Jefferson Ave., Canonsburg, Pa.

FREE! "301 Profitable Small Businesses!" Amazing shoestring plans! Work Home! Start Sparetime! Deumant Surveys, Kenmore 23-T, New York.

WORK At Home. Typists, longhand addressers. Prepare mailing lists and address literature. Be your own boss. Details free. Suppliers Mailing Service, Stillwater 9, Minnesota.

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

EARN Money Evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 2, Wisconsin.

YOU can buy wholesale! Save up to 70% on Nationally advertised jewelry, appliances, watches, etc. Free information. Dorinda Enterprises, Box 77, Huntington Station, New York.

DOLLAR Maker "Tips." A gold mine of information and knowledge. Contains over 1000 valuable Dollar-Making and Dollar saving "Tips." The book you need—the book you want. Price \$2.00 ppd. Money back if dissatisfied. G. B. Distributors, Box 733, Paintsville, Kentucky.

"YOUR own Mailorder Business." Details free write John Franco, 108-62 53 Avenue, Corona 68, New York.

LEARN professional candy making, profitable home business. Details free. Pate, Kissimmee 2, Florida.

MAKE to \$4.50 hour doing common pen lettering. National Artists, 801½-C North Marsalis, Dallas 3, Texas.

BUY Wholesale! Nationally advertised products. Tremendous discounts. Particulars free. Econ-O-Mart, Box 535A, Morristown, New Jersey.

MILLIONS For Small Businessmen. Large list. \$1.00. Proven Enterprises, 334 S. Wabash, Rm. 1, Chicago 4, Ill.

BUY Wholesale thousands nationally advertised products. Save money! Make Money! Postcard brings details. Kemah Company, 5017-F Washington, Houston, Texas.

EARN \$50-\$100 Weekly operating home mail business. We show you how. Write Lewis Bartlett, Richland, Georgia.

OWN, Operate, Route—"Wishing Wells." Place these New \$8.50 Skill Games on counters in Cafes, Clubs, Luncheonettes, etc.—collect coins weekly. Details Free! "Legalchero," Box 929, Long Beach 1, Calif.

WEEKLY extra income mailing circulars for advertisers. Complete instructions 25c. Enterprise, 21-D Sanford, Boston 26, Mass.

FREE! Complete Mailorder Business! Terrific Profits! No investment. Write today. Vita-Mins, 2908-PS, Beverly Boulevard, Los Angeles 57.

AMAZING process permanently seals snapshots, cards, etc. in plastic. Earn extra money taking orders. Send 60c and two snapshots for sample work and particulars. Refundable first order. Variety Sales, Box 11533-P, Los Angeles 48, Calif.

EARN Money. Sparetime. Homework. Free Literature. Wiese, 1516 Franklin, Waterloo, Iowa.

WE Pay Cash for Boxtops, Labels, Wrappers, Coupons, Bottle Caps, etc! Particulars free. Boxtops, PS-983-E Main, Columbus 5, Ohio.

WANTED: Typewriter owners. Make handsome profits. Write today. Groves Company, 682 Hastings 3, Nebraska.

MAKE Seashell Salt-Peppers, Pitchers, Slippers, Vases, Ashtrays. We furnish material & instructions. Lastufka Products, Box 10248, Tampa, Florida.

MANUFACTURE Rhinestone and Pearl Jewelry at home. Latest creations, tremendous profits, no skill needed. Postcard brings illustrated catalog of settings, stones, etc. A. V. Cutt Co., Inc., 210-H Fifth Ave., New York 10, New York.

BE appointed, outfitted, Notary Public. Thousands needed. Men, Women. World's lowest cost. Box 3025, Dallas 2, Texas.

400 RADIO Stations active. Free radio advertising. Pay commission only on orders received. Free information. Mishek, Waseca 1, Minnesota.

FREE Book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-35C, Oceanside, Calif.

MEN-Women: If you are interested in addressing advertising literature for national firm, rush 3c stamp for further information. Advertisers Service, Box 4097-PS, San Diego 4, California.

TO \$35.00 Weekly. Upholstering spare time. Instructions \$1.00. Custom Upholstering, Oxford 2, Penna.

\$45 IN Personalized Baby Record Books. Sell By Mail Use Same Literature We Do. No-Co-Ro, Oakland 6-P, Calif.

EARN extra cash addressing envelopes. Send stamped envelope to Professional Mail Order Survey, Box 1428, Mobile, Ala.

MAKE money by mail! I do. Information \$1. Remson, 158-10A Sanford Ave., Flushing 58, New York.

\$500.000 BY mail from home. Free Folder. Publicity, Kalamazoo 65EB, Mich.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as \$8.00, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising". O. K. Kelly, Classified Adv. Mgr., Dept. 1253, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

500 MONEY Making Formulas, 25c Postpaid. Allen, Dept. PSC, Clinton, Missouri.

ART work. Plaster casting, marble-like hardness. Also washable. Formula \$1.00. E. McLean, Scotsguard, Sask., Canada.

REAL Manufacturing Formulas Lists Free. Cumming, Chemist, Gordon Avenue, Syracuse 4, New York.

FREE Formula Catalog. Anything analyzed \$35.00. Western Chemical, Salem, Ore.

OUR laboratory tested formulas and know-how put you in business. Free information, write Stark Co., Grafton, Wisc.

ANY Formula \$3.00. Chemical Instruction Sheet—catalog 10c. J. Belfort, 216 W. Jackson, Chicago 6.

LABORATORY Tested Formulas. Catalog free. Pont Chemical Company, Terre Haute 1, Indiana.

40 PLASTICS

PLASTICS home-craft course for Men and Women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for Free booklet. Interstate Training Service, Dept. D2-N, Portland 13, Oregon.

NEW liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Castolite Creations Manual and proved Success Plan showing how to make money at home. Castolite, Dept. P-102, Woodstock, Ill.

PLEXIGLAS, Lucite. Any size sheets. Square foot (12x12) cost, 1/16", \$1.18; 1/8", \$1.55; 3/16", \$1.90; 1/4", \$2.25. Add 15% for postage. Minimum order \$3.00. Almac Plastics, 600 Broadway, New York City.

LEARN Plastics at home. Complete course—\$5.98 postpaid. Dime brings sample plastic, three experiments, full details. Plastic Projects, Box 5151, Detroit 35, Mich.

PLEXIGLAS sheets—cut to size—clear, all thicknesses—standard outdoor translucent colors. McClarin Plastics, P.O. Box 168B, Hanover, Pa.

"INTERNAL Carving of Plastic's" illustrated manual, catalog, internally carved brooch, complete \$2.00 postpaid. Plastic's, Box 1812, Salt Lake City 10, Utah.

PLASTIC Sheets, Rods, Tubes, etc. Free List. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

PLASTICS—Cements—Dyes—Findings—Carvings. Wholesale prices. 64 page catalog free. "Trace & Carve" pattern book for carving and coloring fish, birds, animals, only 35c. Taylor & Art, Inc., 1710 East 12th St., Oakland 8, California.

FIBERGLAS, Polyester, Plexiglas, Acetate, Vinylite; Casting, coating plastics; My own Fiberglass "How" book now ready—\$2.50. Fast service, best prices. Catalog—10c. Airmailed—35c. Gem-O-Lite, Box 6868P, North Hollywood, California.

UNUSUAL Christmas decorative materials fill our complete catalogue. Van Horn Plastics, 1905 Ingersoll, Des Moines, Iowa.

41 CHEMICALS & APPARATUS

SPECTROSCOPE for quick chemical analysis \$3.00. Cutting Sons, Los Altos, California.

NEW Idea Chemical and Apparatus Outfits for Home Experimenting Photo-Scales, Microscopes, Chemicals, Biological and Laboratory Supplies in Small Quantities. Catalog 25c. Established 1931. John H. Winn, 124-B West 23rd Street, New York, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS and apparatus for industrial, analytical and private laboratories. Catalog 25c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

CHEMISTRY: Brand new, step-by-step. A painstakingly designed course for all ages. Not a toy. Not a plaything. Cultural, Practical, Fascinating, Constructive. First lesson 25c. Parkway Laboratory, 1004c Second Ave., Pittsburgh 19, Pa.

AMAZING New Book of Science. Experiments, Formulas and catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. 15, 2204 W. North Ave., Chicago 47, Illinois.

42 HELP WANTED

FOREIGN Employment Construction Work. If interested in foreign projects with high pay, write Foreign Service Bureau, (Dept. P.S.), Metuchen, New Jersey.

FOREIGN & Latin American Employment 1953 "Foreign Service Directory" gives Up-To-Minute Facts on Military & Civilian Construction, Government Jobs, Major Oil Listings, Aviation, Transportation, Steamship Lines, Mining, Importers, Exporters, How-When-Where to apply application forms. Hot List Firms Hiring. \$1.00 postpaid. Global Reports, Box 883-S, Hollywood 28, Calif.

ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

ALASKA Directory—Jobs. High Wages. Labor \$2.95 hr. Plumbers \$4.00. Carpenters \$3.34. Truck Drivers \$3.37, etc. Homestead facts. Job List. Application Blank with Directory, \$1.00 post paid. "Foreign Opportunity Directory", Foreign Job List, \$1.00 postpaid. COD—\$1.87. Air Mail \$2.00. Specify Listing. Alaskan Directory, Waseca, Minn.

CONSTRUCTION Jobs: Monthly listings. \$1.00. Construction Employment Service, 1017 Federal Ave., Zanesville, O.

CONFIDENTIAL reports. Highest paying jobs in 28 countries, including U.S., Alaska, South America, Europe, Middle East. Many average \$1450.00 monthly. Skilled, unskilled, laborers, trades, supervisory, clerical wanted. Only \$2, including one year registration-advisory service. Satisfaction guaranteed. National Services, Box 29548B, St. Louis 17, Missouri.

POPULAR SCIENCE OPPORTUNITIES

FOREIGN Job News and Domestic. Send \$1.00 for World Wide Construction Projects. How-When-Where to apply. Global Reports Monthly. Box 883-Sx. Hollywood 28, Calif.

ALASKA!! Last American Frontier. \$1.00 brings 1953 Business Directory & Government Map. Military & Civilian Construction; Homestead & Highway facts; Mining. Aviation. Fur Farming. Grazing. Timber. Travel directions. List of firms hiring. How to apply. Alaska Opportunist. Box 92-S. Hollywood 28, Calif.

JOBS on ships and yachts. excellent pay. Foreign Travel. Davenport's. Dept. 4. Box 1354. GPO. New York 1. N. Y.

FOREIGN & Domestic Jobs. Up to \$12,000. Alaska. So. America. Central America. Far East. U.S. Where-How-to apply. Latest listings world-wide jobs. red hot. "Foreign Opportunity Directory" gives civilian & defense construction. oil companies. aviation. transportation. mining. steamship companies. employment agencies—all kinds of workers needed. Application blank included with Directory. \$1.00 post paid (COD \$1.87) Air Mail \$2.00. Alaska Special Job List \$1.00 postpaid. Specify Listing. Foreign Opportunities. Waseca. (PS1). Minn.

CREDIT Correspondents wanted. Work furnished. Small investment. Very profitable. Write National Correspondent Service. 1754 Van Buren Ave., St. Paul 4, Minnesota.

JOBS—Foreign and Domestic. skilled. unskilled. clerical. etc. Highest pay. Free information or send \$1.00 for complete details. Job Application Service. P. O. Box 1022B. Baton Rouge 1. Louisiana.

\$1300 MONTHLY for truck drivers. \$1400.00 monthly for carpenters, electricians, plumbers, mechanics. \$1200.00 for clerks and laborers. Replacement hiring now being done. Full information and complete foreign listings, with current information on Spain job. \$1.00. Women's listings. \$1.00. 25,000 men and women needed for new stateside project! Complete information and other domestic listings. \$1.00. Dept. 4-L. Opportunities Unlimited. 1110 Commerce Bldg., St. Paul, Minn.

WORLD Wide Employment: Want to travel? Big pay. Transportation free. Most trades available: Monthly listings. oil. construction government. aviation. steamship. manufacturing. and many more. Positions available in most foreign countries. How to apply. application forms. contracts. etc. \$1.00. World Wide Employment Service. 1017 Federal Ave., Zanesville, Ohio.

MEN Earn \$1,500.00 per month on Foreign projects. (See Reader's Digest December 1952 issue, page 21) Men Wanted now on Foreign, Latin America and Far North projects. Truck Drivers, \$3.55 hour. Clerks, \$3.00 hour. Electricians, \$4.00 hour. Carpenters, \$3.70 hour. Laborers, \$3.00 hour. Most all trades wanted. Up to 70 hour week with time and one half for all over 40 hours. Transportation paid. 8 to 24 month contract. New treaty with Spain, South Korea will start new bases at once. Get in on start. Full information of over 20 sheets 9 1/2 x 11 listing over 200 firms now hiring. conditions. wages. hours. contract requirements. application form. etc.; also latest issue of our monthly Bulletin listing new contracts and coupon worth \$1.00 on subscription. All for \$1.00. Airmail \$1.24. Edward O. Burns, 911 N. Lancaster Avenue. Department 30. Dallas, Texas.

KANSAS City Want ads mailed. 50c per classification. Kithcart, 2630 Charlotte. Kansas City, Mo.

FOREIGN & Alaska Latest List Contractors openings. \$1. Quinn, 1218 South Clayton. Denver, Colorado.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as \$8.00, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising". O. K. Kelly, Classified Adv. Mgr., Dept. 1253, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

GOLDEN California—Men needed. Thousands of openings. Jobs to \$5,000.00 year unskilled. \$8,000.00 year skilled. Act Now! Send \$1.00; California Job Opportunities. Box 870-J. Los Angeles 53, California.

HONOLULU Help Wanted columns airmailed \$1.00. Pomeroy's, #3 Campbell Block. Honolulu, Hawaii.

42A EMPLOYMENT SERVICES

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OVERSEAS Jobs. Big pay. transportation expenses. Clerical. professional. mechanical workers. Most all trades. Latest listings. airline. construction. manufacturing. oil. steamship companies. government agencies. many other opportunities. Up to date information on securing employment. contracts. income tax. application forms. \$1.00. Overseas Jobs. Box 335-B16. Baton Rouge, La.

CONSTRUCTION Job List. Published Monthly. \$1.00. Dempster's Construction Month News. Dept. 268-NW. Bridgeport, Ill.

43 AGENTS WANTED

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide. listing hundreds of companies who'll pay you well. full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 18, Chicago 4, Illinois.

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BIG Money making opportunity. Exclusive line work uniforms. Jackets. pants. shirts. coveralls. Advertising embroidered. Every business prospect. Outfit Free. Master Div., Dept. 725. Ligonier, Indiana.

MAKE Christmas Money At Home. Take renewals and subscriptions for all magazines. Big Christmas profits now. Liberal Commissions. Everything furnished. Free Catalog. Write McGregor Magazine Agency. Dept. 510A. Mount Morris, Illinois.

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101 WAYS To Make \$1,000 At Home. Details free. Business Surveys, 365 So. Fairfax. Los Angeles 50, California.

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WHERE To Buy 800,000 Articles Direct from manufacturers at wholesale prices. Save up to 50% on nationally advertised merchandise. Rush \$1.00 for big 52 page book. Glass Publishing Company, Ellwood, City, Pa.

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ADDRESS advertising postcards. Must have good handwriting. Lindo, Watertown, Mass.

STRANGE "Dry" Window Cleaner. Sells like wild. Replaces messy rags. liquids. Simply glide over glass. Samples sent on trial. Kristee 126. Akron, Ohio.

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AFRICAN Exports Save 50% Leather goods. Send \$3.00 for sample and literature. Drown, B.P.O. Box 302, Tanger, Morocco.

"FREE Razor Blade"—wanted 10,000 men to try our blades. Send for free sample, no obligation. Distributors—Wanted. Mailomatic Service, 26 Court Street, Brooklyn 1PS, New York.

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MEXICAN Feather Pictures. Sell on sight; 200% profit! Free details. Sample 20c stamps. (No Coins). Sylvias, Apartado 9036, Mexico City.

EASY handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Mass.

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"GENUINE Silverplating Polish". (Cloth rub on.) \$1.50. NuSilver, 508-PS12, Aurora, Illinois.

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\$1.00 PROFIT selling \$2.95 photo enlargement offer Allen Studio, Riegler Bldg., Little Rock, Arkansas.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as \$8.00, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising". O. K. Kelly, Classified Adv. Mgr., Dept. 1253, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

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WOMEN Mail Buyers List. \$5.00 thousand. Lakeland Sales, Butler, New Jersey.

MAILING lists. All types. \$5.00—1000. Melody Mailers, 8031 Biscayne, Miami, Fla.

MAILING Lists. All kinds 1000 \$5.00. Dixie Service, King, North Carolina.

NAME Lists! Nationwide. Bulletins Free. Mailtrader, Box 643, Ann Arbor, Michigan.

DOLLARS in the mail for you! Put your ad here and watch orders fill your mailbox. For as little as \$8.00, you can advertise your product or service in the classified opportunities columns of Popular Science Monthly. The February issue closes on December 22nd. Write today for order blank and free copy of booklet "How To Make Money Out Of Classified Advertising". O. K. Kelly, Classified Adv. Mgr., Dept. 1253, Popular Science Monthly, 353 Fourth Ave., New York 10, N. Y.

51 SPECIAL SERVICES

LETTERS Air Mailed From Old Mexico. Mexico City—Guadalajara—Mazatlan—Guaymas—Hermosillo \$1.00. Postcard 50c. A. Espejo, Box 217, Tijuana, Mexico.

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POPULAR SCIENCE OPPORTUNITIES

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BUSINESS cards samples, prices free. Malmart, 1776 79 Street, Brooklyn 14, N.Y.

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BUSINESS. Personal stationery. Catalog free. McIlvaine, Box 86-PS, Brooklyn 30, New York.

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TWO color 8 1/2 x 11 letterheads, 500—\$3.50. Samples. D'Yarmett Service, Newark, Ohio.

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REGISTERED Patent Attorney offers services. Sanders, 6430 Evans, Chicago 37, Illinois.

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INVENTORS—If you believe that you have an invention, you should find out how to protect it. The firm of McMorrow, Berman & Davidson is qualified to take the necessary steps for you. Send for copy of our Patent Booklet "How to Protect Your Invention" and "Invention Record" form. No obligation. McMorrow, Berman & Davidson, Registered Patent Attorneys, 143-W Victor Building, Washington 1, D.C.

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INVENTORS: When you are satisfied that you have invented something of value write me, without obligation, for information as to what steps you should take to secure a Patent. Write Patrick D. Beavers, Registered Patent Atty., 938 Columbian Bldg., Washington 1, D. C.

60 FOR INVENTORS

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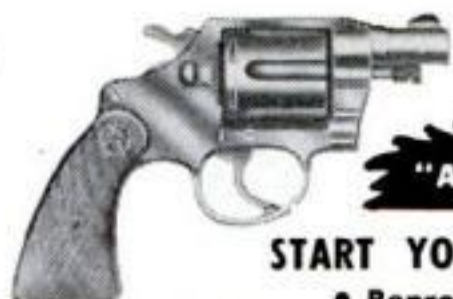
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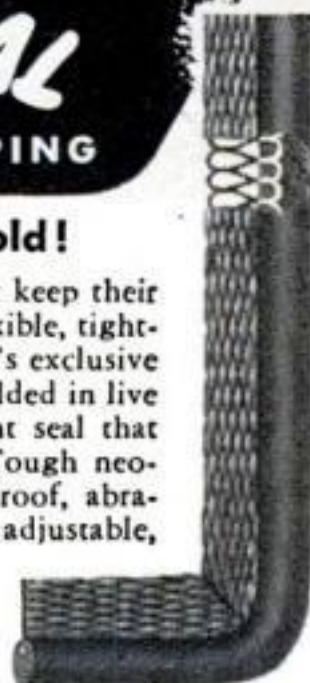
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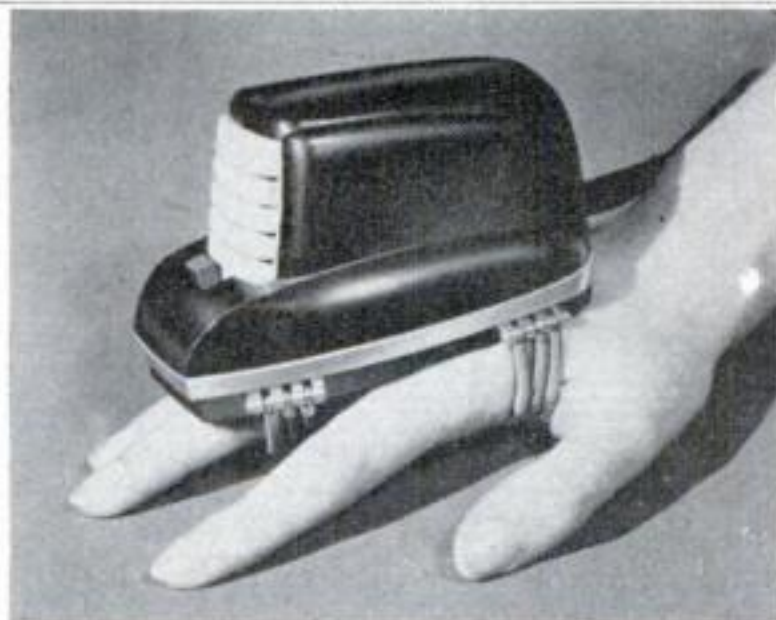
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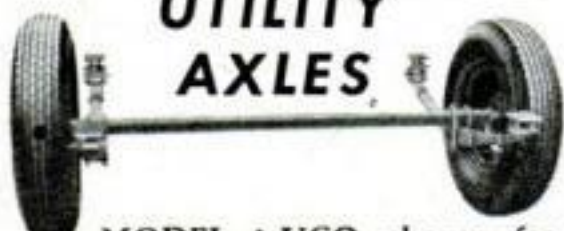
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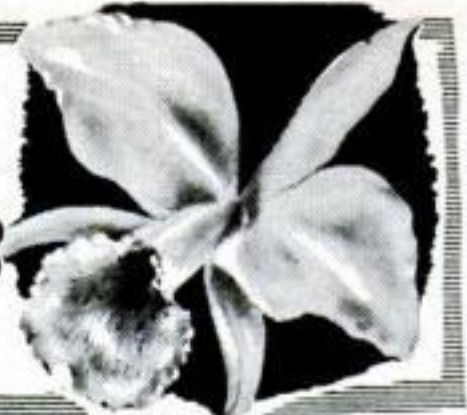
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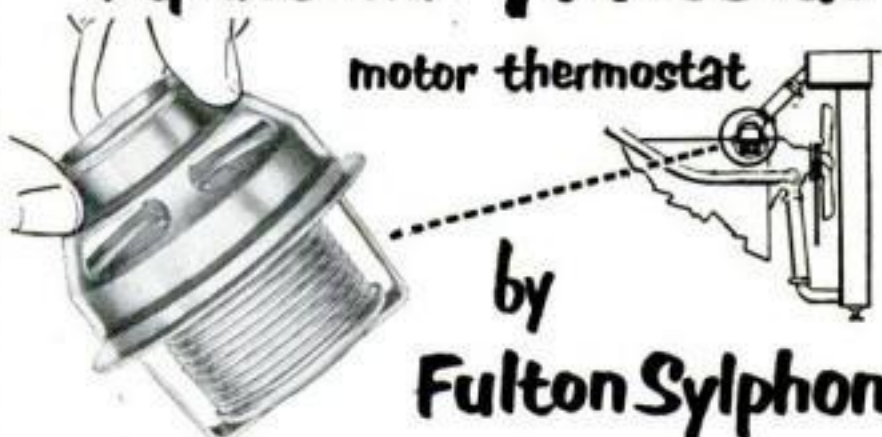
This WINTER

CHECK YOUR MOTOR THERMOSTAT

A dirty, damaged or over-age motor thermostat impairs your car's cooling system. This often results in engine "boil-overs" and loss of anti-freeze. Also, an over-heated engine wastes gas and oil . . . while one that runs too cold results in failure to warm your car heater.

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This newest and lightest Impacttool has the time-proved Ingersoll-Rand impact mechanism that has an unmatched reputation for power and dependability in both air and electric Impacttools. The "rotary" impacts do all the work. There's no kick or twist to the operator and the motor can't stall or burn out.

Ask for a demonstration of this new powerful little Impacttool. Size 2U Impacttool only \$97.50, also available in metal kit with multi-purpose attachments. You'll find it featured by leading automotive jobbers and industrial distributors from coast to coast. Ask for a demonstration or write for catalog.



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Diesels Even Run Bikes Now

This 11-pound kerosene engine makes riding cheaper than walking.

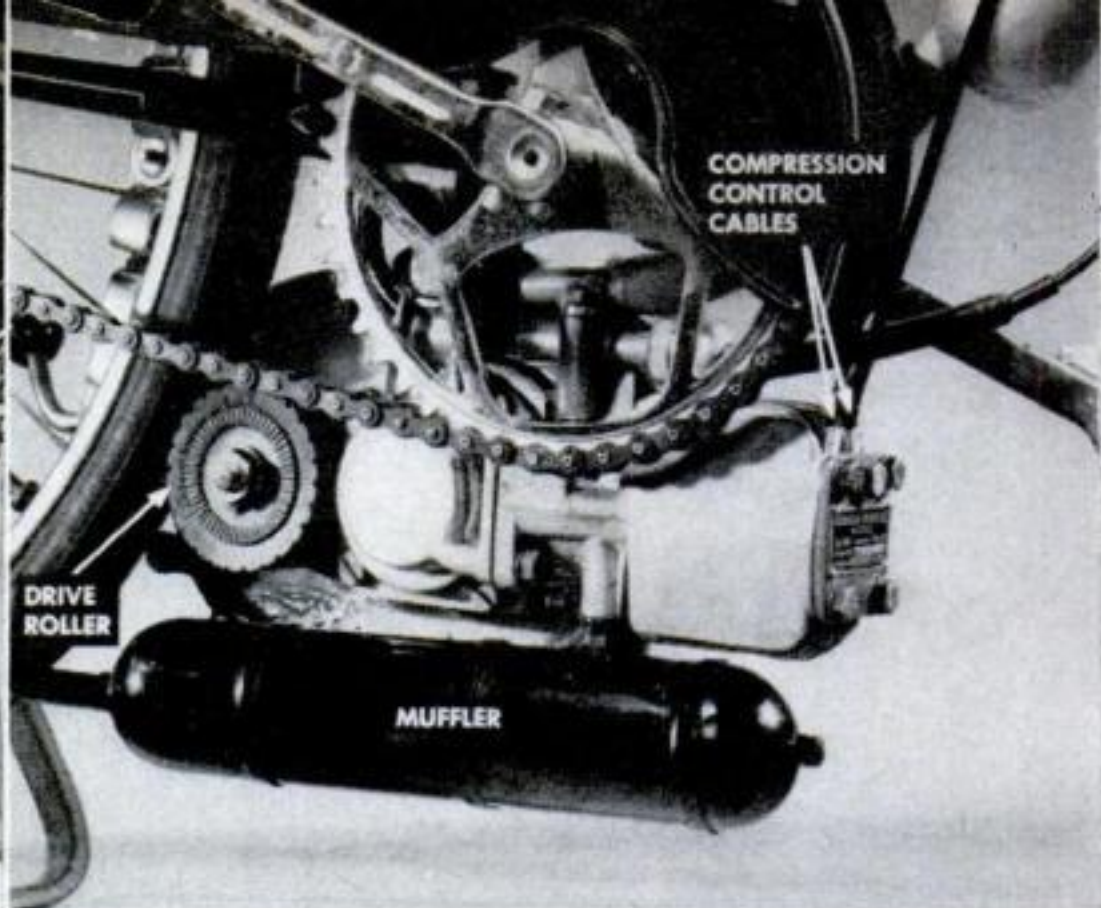
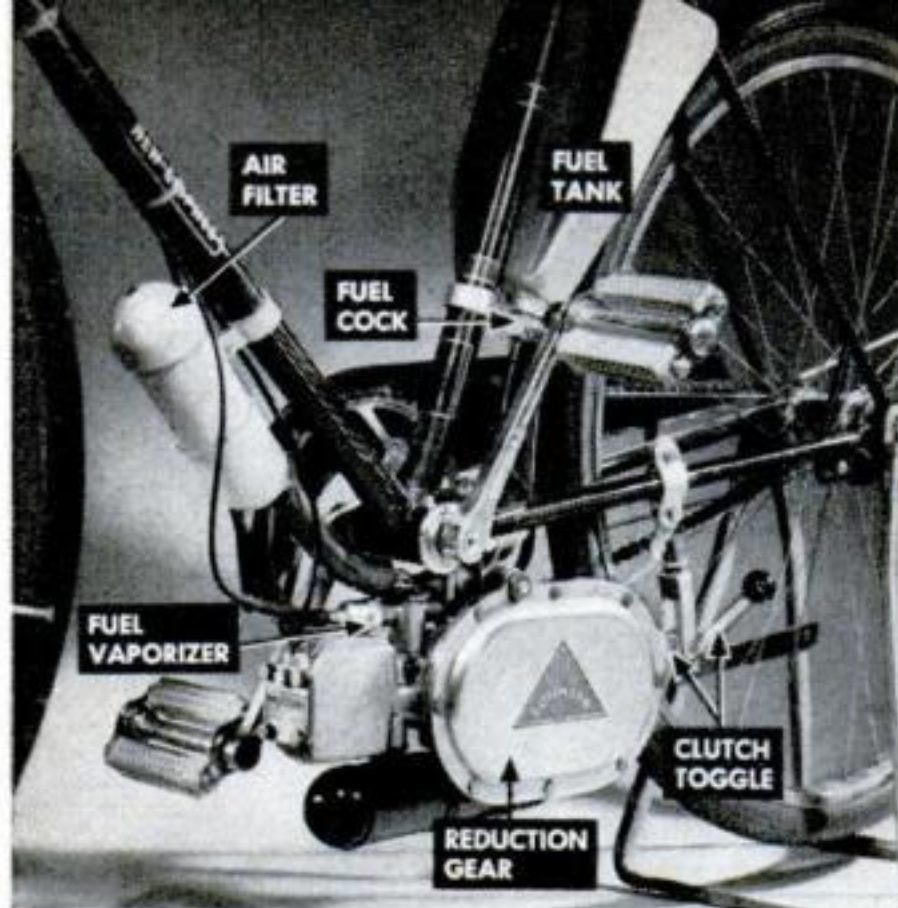
By Harry Walton

NOT content with shoving steam off the rails and nudging the gas engine aside on our highways, the diesel is now barking at the heels of bike riders.

You have to look twice to find this $\frac{3}{4}$ -hp. job on the bicycle. Measuring only three by six by 13 inches, it nestles close under the pedals, keeping its 11 pounds as close to the ground as a politician's ear.

Nor will you find any complication of sprockets, chains, pulleys or V belts. The drive to the rear wheel is by a rubber friction roller in direct contact with the tire. If you should run out of fuel (which scarcely seems possible) you can push a lever to free the roller, and pedal on.

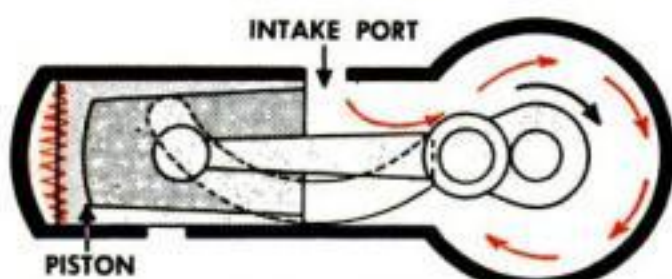
Pedal to start it. Invited to ride, you give the midget another dubious look and hoist your poundage onto the bike. At once engine drag makes itself felt. You have to lean hard on the pedals to get moving, for you're spinning the crankshaft too. Then you remember to



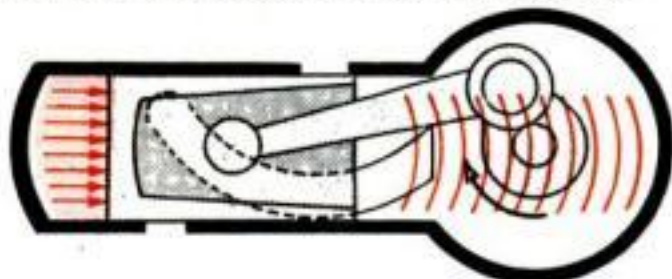
ENGINE IS HUNG just below crank bearing on a single bolt. Drive roller can be disengaged from rear wheel for ordinary pedaling by lifting ball-tipped lever. Control cables, already connected, are simply tightened on handle bars. Installation takes 12 minutes.

WHEEL IS DRIVEN by a 2½-inch roller in contact with tire. With 1:3 reduction gear built into motor, this provides an over-all reduction of more than 30 to one. Tire diameter has no effect on top speed; engine will drive a 24-inch bike at same rate as a 28-incher.

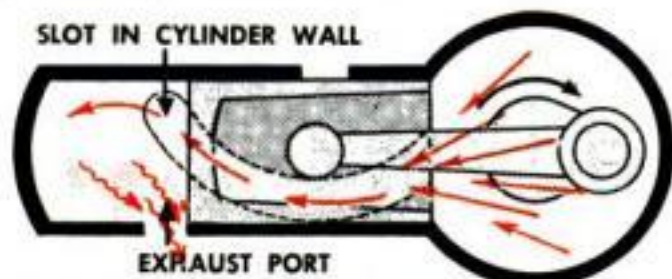
HOW TWO-CYCLE ENGINE WORKS is shown in four steps. Precise instant of firing is controlled by degree of compression. Transfer slots in cylinder provide path for crankcase charge to get above piston. Slots are curved to give incoming charge a path that directs it away from exhaust port and helps scavenge exhaust gases with minimum loss of fuel.



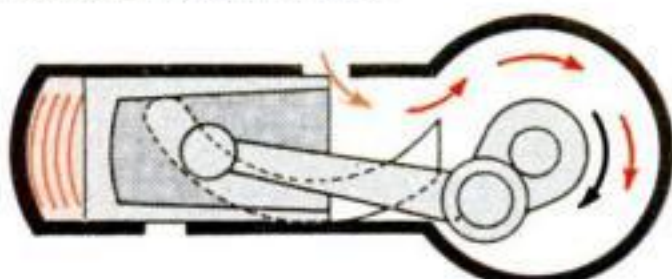
AT TOP DEAD CENTER, CRANKCASE CONTAINS FUEL-AIR MIX. CHARGE ABOVE PISTON IS COMPRESSED TO FIRING TEMPERATURE.



ON WORK STROKE, CRANKCASE CHARGE IS COMPRESSED BELOW PISTON, WHICH COVERS BOTH PORTS.



AT END OF WORK STROKE, PISTON UNCOVERS EXHAUST PORT AND TRANSFER SLOTS. PARTIALLY COMPRESSED CRANKCASE CHARGE ENTERS CYLINDER AS EXHAUST OCCURS.



RETURNING PISTON CREATES VACUUM IN CRANKCASE, DRAWING IN FRESH AIR-FUEL MIX AS INTAKE PORT IS UNCOVERED. MEANWHILE NEW FIRING CHARGE IS COMPRESSED ABOVE PISTON.

cut in compression, and the pedals get even harder.

But suddenly the engine catches, takes off with a soprano bark. You're power-borne, and feel a bit foolish as the pedals go slack. As you hastily retard the compression control, the engine dies.

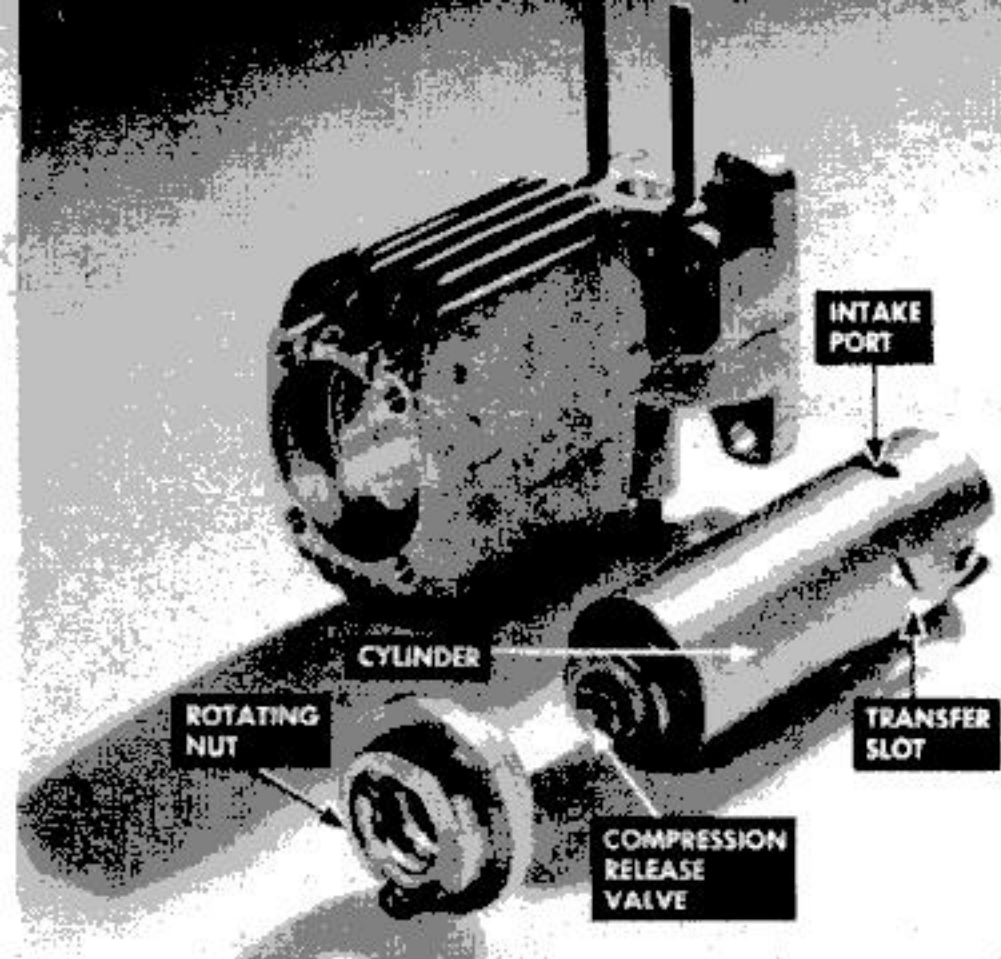
You turn the compression control fully back and start again. This time, when the engine catches, you adjust fuel and compression warily. Finding the strategic point where the engine runs smoothly, you relax to enjoy power biking.

Throttling down, you can roll along at little more than a walk. Open up the fuel, adjust compression to match the load, and you're rolling at a brisk 22 m.p.h., a good pedaling clip.

At this rate, the engine is revving up to about 6,000 r.p.m., not an excessive speed in view of its alloy piston, roller-bearing big end, and ball-bearing shaft.

Hitting a hill, the engine buckles right down and pulls. Back off the compression a bit—it acts something like the spark advance on yesterday's cars. You slow down, but you'll keep rolling up any grade the average car can pull in high gear. On tougher ones, you help the engine by pumping.

Twentieth of a cent a mile. Importers of the German-built engine claim it will



STEEL CYLINDER, closed at head end, slides short way in finned housing to alter compression ratio. Nut turned by control cables works on threaded part of cylinder to govern its position. Transfer slots are closed by housing wall, forming channels for fuel charge.

run a bike about 150 miles on a tankful of juice—less than half a gallon.

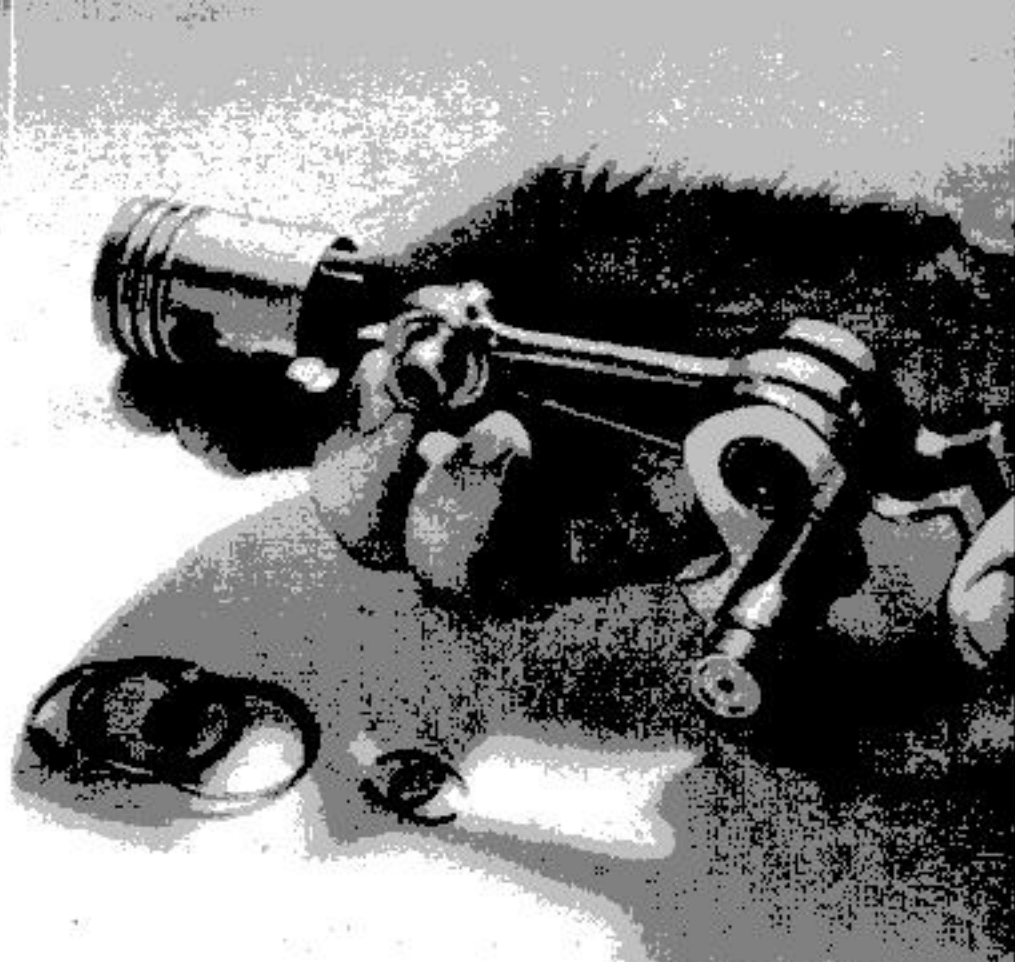
With kerosene at 15 cents a gallon, this would work out to 1/20 of a cent per mile. At today's price for half-soling, this makes riding cheaper than walking.

Of course the drive roller puts an extra friction load on the rear tire, which will therefore wear somewhat faster. The roller itself will require occasional replacement. And in addition to fuel, you have to buy motor oil, which is added to the tank. A jigger in the cap measures out correct proportions.

Compression ignites fuel. Strictly speaking, the engine is a two-cycle, compression-ignition job rather than a full diesel, since the fuel is atomized and drawn in with the air instead of being injected. But it works like a diesel in that there is no magneto, battery, spark or glow plug. Only compression heats the charge to the firing point.

You can buy the engine for either gasoline or kerosene operation. The only difference is maximum compression ratio—30 to one for gas, 33 to one for kerosene.

These compression ratios are for a cold engine. Once it's hot, they drop to less than half. The reason: the charge, as it enters the cylinder, is heated and



MIDGET PISTON is 1 3/32 inches in diameter (cylinder bore is 28 mm.). Piston has three rings, pinned to prevent rotation. Big end of con rod, pressed between crank webs, is fitted with roller bearings. Shaft runs on ball bearings. Stroke is 30 mm. (1 3/16 inches).

expands so that the actual amount (by weight rather than volume) is less.

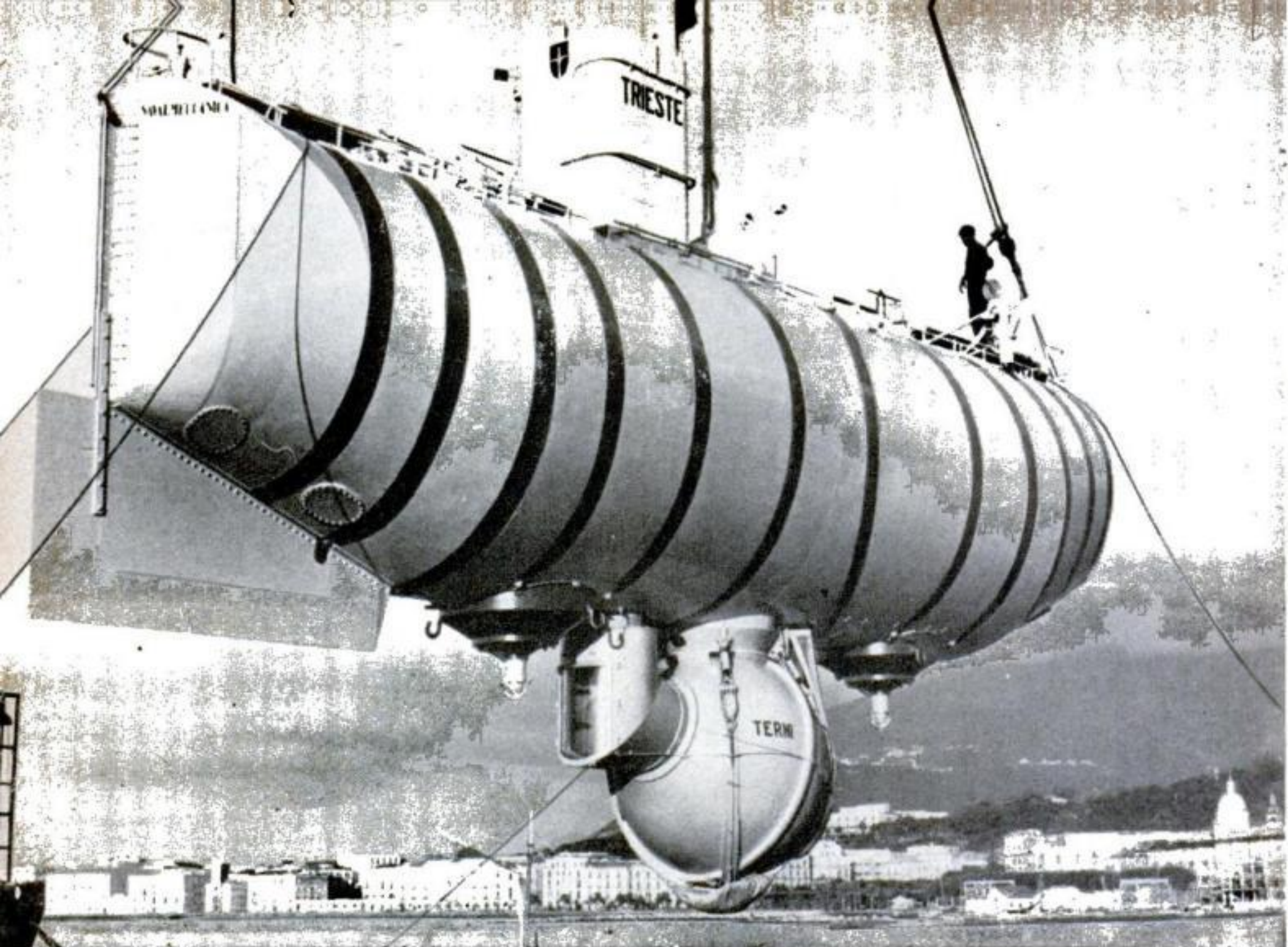
You vary compression. When cold, the engine has to be pedaled about a block to start it. Once hot, it roars at the first turn of the wheel. There is no driving clutch—you let the engine die at stops, and pedal it to a start when you go off again.

Hard starting, always a problem with diesels and small ones especially, is largely overcome by controlling compression ratio. The cylinder and head are virtually one piece, made to slide a short way inside the finned, die-cast housing. A round nut working on a thread on the cylinder can draw it back or forth, changing the distance between cylinder head and crankshaft, and therefore the compression space. The nut is connected to control cables.

Turned all the way out, the compression control slides the cylinder so far back that a protruding pin strikes the finned cover, opening a valve in the cylinder head. This releases compression to make it easier to start engine. A twist of the wrist restores compression.

Imported by Newage International, Inc. of New York City, the engine is sold by Gimbel's and other retailers throughout the country.

END



Gasoline-Filled "Balloon" Goes Down Two Miles into the Sea

THIS weird craft is a "bathyscaphe" in which Prof. Auguste Piccard recently descended to record 10,330-foot depth in the Mediterranean. Like an earlier design (PSM, Dec., '47, p. 82), it maneuvered as an up-

side-down "balloon," unattached to any cable. Gasoline in the hull-like structure was the buoyant medium, magnets held or dropped iron ballast, and the ball at bottom was the passenger gondola.

Jeep Attachment Munches Snow

DON'T throw a snowball at this jeep—it can throw back faster than you can. An extra engine out back powers the horizontal screws by an outsize flexible shaft, shown curling over the hood. A high-speed impeller throws the snow as far as 100 feet off the road. The attachment, made by Brede Products, Minneapolis, weighs 850 pounds.



Loggers Get Mechanical Loader

HERE'S a mechanical arm that has a 17-foot reach and enough muscle to lift 3,000 pounds of pulpwood at a clip. Jointed to bend like a human arm at wrist and elbow, it can pick up a quarter cord of eight-foot logs in its fist. The Badger Machine Co., Winona, Minn., makes it for mounting on any 1½-ton or larger truck.





New Styles in Helmets for Junior's Interplanetary Junkets

SNAP-ON helmet with domed top is official headgear on a popular TV show. It has simulated headphones and a hinged transparent facepiece that can be lifted while Junior downs his cereal before blast-off. This one is sold as a premium by General Mills.

BUBBLE job has shoulder plates and chest harness to keep it in place during intergalactic rough-housing. Flexible antenna on top is spring-mounted and plastic-capped for safety. Made by Arant Plastics, 1004 Folsom St., San Francisco.

SPACE cap has hinged goggles that flip up or down. Cone-shaped radar antennas around the lenses rotate to pick up blips from hostile raiders. A down-to-earth elastic chin strap holds it firm despite juvenile accelerations. Banner Plastics, Paterson, N.J.

Vacuum Helps Build a Plane

PROBLEM: how to fit a large corrugated metal tube inside a slightly smaller pipe? Solar Aircraft engineers solved it by applying vacuum to shrink the big pipe temporarily while the shroud is slid over it (right). The assembly is an augments tube for plane-engine exhaust gases that also gives warm air for cabin heating and anti-icing.

▶▶▶Chicken feathers may supply the bristles for paintbrushes, replacing Chinese hog bristles now blocked behind the Iron Curtain. A way has been found to convert feather protein into a synthetic bristle.



They Say Now

ALEXANDER W. STERN, PHYSICIST: "Physics begins with the desire for knowledge and truth and ends in wonder—the wonder revealed by newly discovered truths of nature and in the miracle of existence."

AN ANONYMOUS CHEMIST, IN "LETTERS TO THE EDITOR" PUBLISHED IN CHEMICAL AND ENGINEERING NEWS: "Progress is usually made by questioning the unquestioned assumptions of 'the authorities.'"

AUSTIN N. STANTON, PRESIDENT, VARO MFG. CO.: "Many tests have been devised to predict the potentials of young people but I sincerely hope that none ever prove successful . . . No one uses more than a small fraction of his mental capacity. Why should it be assumed that this fraction should be the same for any two individuals? . . . The one whose total mental capacity is smaller than his neighbor's might easily use a slightly larger fraction and surpass him in creative thinking and work."



"So Moses went down unto the people, and spake unto them."—Exodus 19:25.

THE STORY OF MOSES and the Ten Commandments, illustrated here by Gustave Doré, is

in the Book of Exodus, the oldest known version of which was found recently in a cave.

READING THE BOOK OF ISAIAH in the world's oldest edition. Prof. John C. Trever (see chart on next page) discusses the Isaiah scroll with a Syrian Orthodox dignitary in Jerusalem shortly after the scroll was discovered.



Scholars say the discovery of more ancient manuscripts near the Dead Sea may be "the most sensational archeological event of our time."

OVER in Jerusalem this Christmas season, men are working hard and reverently, and with every chance of success, to throw new light on the Greatest Story and the Greatest Book.

They are bearded French Dominicans who are both scientists and priests. Members of the staff of the École Biblique et Archéologique Française—French Biblical and Archeological Institute—they have been entrusted with sorting out, preserving, and publishing a great new find of ancient manuscripts, the second in six years, from a cave above the Dead Sea. Scholars associated with the American School of Oriental Research are working with them.

The newly found manuscripts, originally written on sheets of parchment or leather, which were then sewn together to form scrolls, are now in fragments—bushels and bushels of them—the largest no more than half the size of this page. They are brittle, and some so darkened with age that it takes infrared photography to bring out the writing.

But this much is already clear:

The manuscripts date back to the earliest days of Christianity, and before. They include many copies of Old Testament books that may prove to be the most ancient Biblical texts in the original Biblical languages in existence. They also include books dealing with a little-known sect of Jews with whom John the Baptist may have lived.

Bedouins (Arabian nomads) discovered the manuscripts last year but news of the find was held up until after the Kingdom of Jordan, which feared that the documents might be smuggled out

Infrared Rays Clarify the Oldest Bible Texts

By Herbert Yahraes



MAP shows where the latest scrolls were found, in ancient Essenes' country.



TIGHTLY ROLLED SCROLL of Lamech, which probably contains the most ancient account of the life of Noah. It appears as it looked when found, except that one fragment has

been removed. The manuscript is in Aramaic, the language of Jesus, and probably dates from early 1st century A.D. If so, it is the oldest Aramaic manuscript ever discovered.

of the country and sold elsewhere, had paid the tribesmen \$42,000 and given the treasures to Father Roland de Vaux at the École Biblique for preliminary study.

G. Lankester Harding, British-born archeologist who is Director of Antiquities for Jordan, calls the discovery "perhaps the most sensational and outstanding archeological event of our time."

Harding ought to know. Since 1949 he has been racing the Bedouins to new discoveries, and this year he and other archeologists completed a second season of excavation at a small, ruined settlement now called Khirbet Qumran. This

was built on a natural shelf several hundred feet above the northwest shore of the Dead Sea, in an area known in Biblical times as the wilderness of Judaea. The caves in which most of the manuscripts have been found are only short walks away.

Qumran turns out to have been the headquarters for the Essenes, or a related group of Jews—the sect that owned the scrolls and that hid them in the caves probably about 1,900 years ago.

The settlement consisted principally of a monastery-like building, which included a meeting hall for members of the order and a room fitted out with a

	6TH CENT. B.C.	3RD CENT. B.C.	?	?	EARLY 1ST CENT. A.D.	9TH CENT. A.D.	20TH CENT. A.D.
H							
K							
M							
S							

HOW DEAD SEA SCROLLS CAN BE DATED is demonstrated by a chart prepared by Prof. J. C. Trever, of Morris Harvey College, W. Va. It compares the forms of four letters from Hebrew-Aramaic manuscripts of known date with the forms of the same letters as they appear in the Dead Sea scrolls. You can easily see that letters in the left-hand center column (Isaiah) closely resemble but are more mod-

ern-looking (and therefore later) than those from the 3rd century B.C. Letters in the right-hand center column (Habakkuk), on the other hand, are still more refined but not quite so much so (and therefore earlier) as those from the 1st century A.D. Scholars figure that the Isaiah scroll dates from late 2nd or early 1st century B.C. and the Habakkuk Commentary from late 1st century B.C.



THE FIRST PAGE OF ISAIAH, in the Dead Sea scroll, looks like this. It is written on 17 sheets of sheepskin. The sheets are sewn together with linen thread, making up a manu-

script 24 feet long. Since Hebrew reads from right to left, the first verse of Chapter I begins at the upper right. (*Photos courtesy of American Schools of Oriental Research.*)

table, bench, and inkpots for scribes working on the sacred scrolls.

Coins found in the ruins indicate that the Essenes lived there from some time in the second century B.C. until the time of the first Jewish revolt against Rome, in 70 A.D. Some scholars suspect that it was from there that John went forth to baptize in the Jordan River, just a few miles away, and to tell his questioners from Jerusalem: "I am the voice of one crying in the wilderness, 'Make straight the way of the Lord' . . ."

The story of the new finds actually begins in the spring of 1947, when an Arab shepherd—chasing a goat, one version says—stumbled upon a cave he'd never before seen and found a number of covered jars. These held nothing but crumbling scrolls wrapped in linen, so the shepherd and his companions—all of them Bedouins of the Ta'amireh tribe—handled them with no particular care.

Tribesmen Went to Bethlehem

One market day, though, the tribesmen took the scrolls up to Bethlehem, some 20 miles off, and showed them to a merchant who happened to be a member of the Syrian Orthodox Church. He sent them to Jerusalem, where the Archbishop later bought some of the scrolls.

Other leaders in his church, several antique dealers, and two visiting European scholars assured him the scrolls could be of no great age, but he got more welcome news from the American School of Oriental Research, which is supported, together with a school of the same name in Baghdad, by 60 American universities, colleges, and seminaries.

Dr. Trever Unrolled the Scroll

It was Thursday afternoon, February 19, 1948—and cold in the school because the Arab-Jewish war had cut down fuel supplies—when Dr. John C. Trever, the acting director of the school, now professor of religion at Morris Harvey College, laid the largest of the scrolls on his bed and began unrolling it.

What he thought he saw he could hardly believe. There was a box of slides on his desk to illustrate a lecture on "What Lies Back of Our English Bible?" and he thumbed through these till he came to the section on early Hebrew manuscripts. One picture showed part of a Biblical text from the ninth century; the scroll on the bed was obviously far older. Another picture showed the so-called Nash Papyrus, containing the Ten Commandments and a few other verses from Deuteronomy. The Nash Papyrus

was only a fragment but it dated back to the first or second century B.C. and was the oldest copy of a Biblical work that had come down to us in the original Hebrew. Trever looked at this picture of it and then at the newly found scroll: the writing was strikingly similar.

The large scroll, almost 24 feet long, proved to be a copy of the complete book of Isaiah, and further study the next few days convinced Trever and a colleague, Dr. William H. Brownlee, that it was at least as old as the Nash Papyrus. With the Archbishop's permission, he photographed it, column by column, and rushed prints to Dr. W. F. Albright of Johns Hopkins University, a leading authority on ancient manuscripts. Albright wrote back: "The greatest manuscript discovery of modern times! . . . What an absolutely incredible find!"

Some scholars considered the find literally incredible. They said the manuscripts looked much like those written in medieval times, and one suggested, further, that they might have been stolen from some library.

Several sciences combined, however, to refute the doubters. Archeology established that the jars in which the manuscripts had been stored were similar to other pottery used in the first century of the Christian era. Paleography, the study of ancient writing, established that the script of the Isaiah scroll most nearly matched the script used by Hebrew copyists of approximately the second or first century B.C., while the script of most of the other documents was somewhat more modern, coming down into the first century A.D. (One document, a fragment of the book of Leviticus, looks as if it might have been written as early as 600 B.C., but in this case there is a suspicion that the copyist was trying to give his writing an antique appearance.)

Then in 1951, Dr. Willard F. Libby, University of Chicago radiochemist who developed the radioactive carbon 14 method of dating organic material, tested a sample of the linen in which some of the scrolls had been wrapped and reported a date of 33 A.D., with a margin of possible error of 200 years either way (PSM, Dec. '51, p. 98).

One Scroll Has Not Been Opened

Among the scrolls discovered in 1947, besides Isaiah, one has been identified as a commentary on the Old Testament book of Habakkuk; one as a Manual of Discipline, containing rules and ceremonies of the sect that owned the manuscripts; and another as a collection of Songs of Thanksgiving.

There is also a scroll that hasn't been opened yet but that Dr. Trever, judging by a fragment of it, believes is an account purportedly written by Lamech, the father of Noah.

The fighting in the Holy Land made it impossible to follow up the Bedouins' discoveries until 1949. Since then Harding and archeologists from the

École Biblique, the Palestine Museum, and the American School—sometimes ahead of and sometimes behind ransacking tribesmen—have found 40 or 50 other caves. All contained pottery fragments; some held pieces of manuscripts.

Caves 12 miles south of Khirbet Qumran have yielded documents that suggest when the end came to the Jewish settlement in this general area and why. One is a marriage contract dated in the seventh year of the reign of the Roman Emperor Hadrian, which was 124 A.D. Two others are letters from Simeon ben Kosibah to one of his generals, Yeshua ben Galgoleh. It was Ben Kosibah who led the Jews' second, and last, revolt



SCENE ABOVE is typical of country in which the Biblical scrolls were discovered by Bedouin tribesmen.

[Continued on page 248]



Swimmer Hoists Her Own Jib and Makes Like a Sailboat

MRS. Wynne Owen Smith, an English swimming instructor, serves as her own streamlined hull when she wants to do a

little yachting. Hoisting sail, she takes off with the mast strapped to her middle. She trims sail with her teeth and feet.

Artist Customizes a Taxi

ROY ALDERSON, a London muralist, did the eye-catching paint job on the old taxicab at right. Hood, fenders and most of the body now look like pink quilted satin while floral medallions decorate the doors. To top things off, the body is framed in yellow and wears a set of painted green drapes. The job took three months.

▶▶▶ Licking the flaps of bank-by-mail envelopes used by one California bank is no chore—the glue is peppermint-flavored.



NEW TOYS

*Santa favors
blocks and models
this year.*

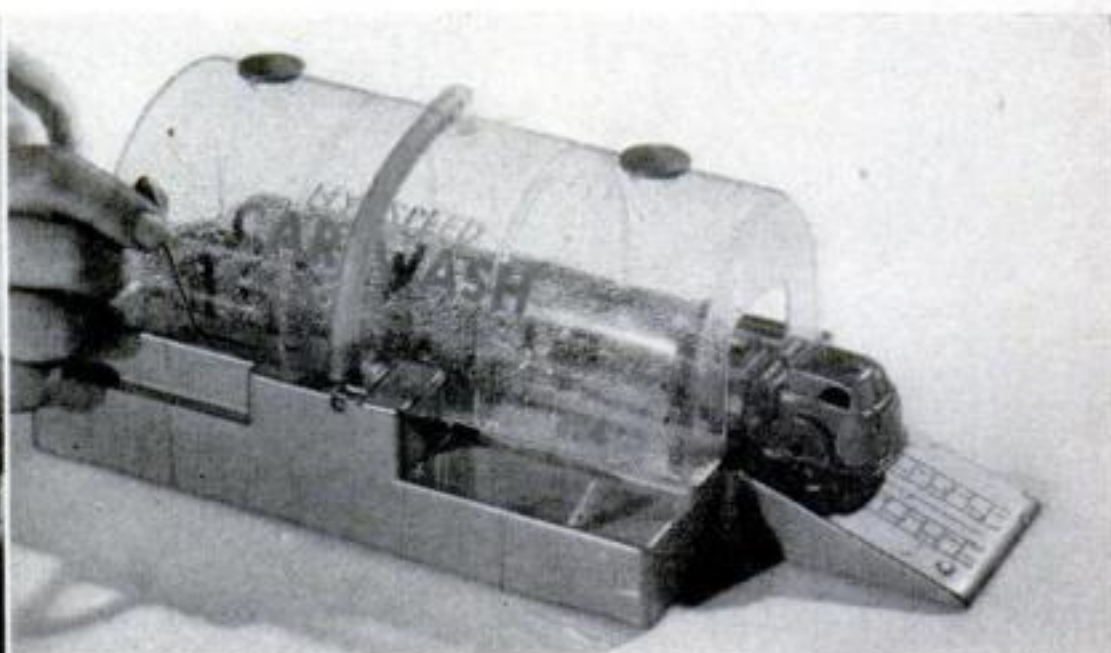


1. Changeable blocks let a youngster build four different structures by exposing different sides of the blocks. When bored

with the fire house, the little girl above can turn the blocks into a colonial home, a service station or a log cabin.



2. Hollow cardboard blocks are big enough to train a baby to grip large objects, strong enough to support 100 pounds, light enough to be tossed safely. Sold flat, they can be put together by a six-year-old.



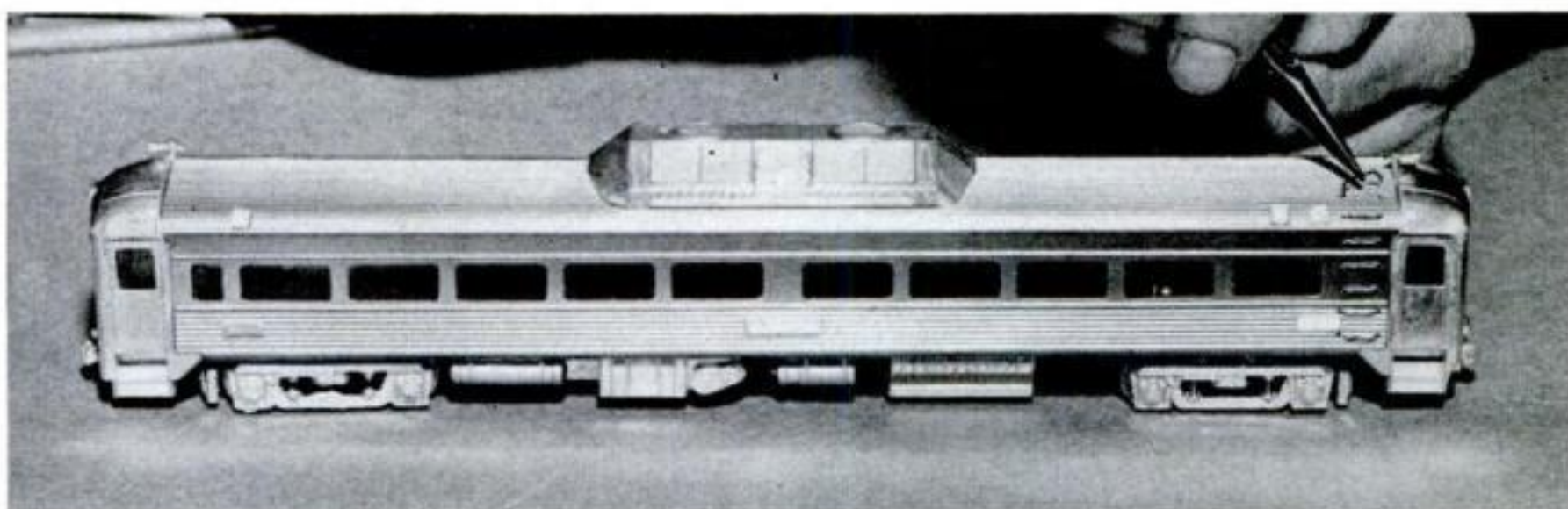
3. Car Wash sprays plastic automobiles as they ride through on a lever-actuated belt. No water gets on the floor—a pan in the base catches it from the nozzle and stores it for re-use.



4. Tractor is a scale model of an International diesel. Pushing levers on the 110-volt control box makes it turn, climb, push, pull, reverse or bulldoze. Rubber treads protect floors for indoor play.



5. Coaling station tilts an operating dump car's load into an elevator, which hoists it to overhead position, then empties it into waiting car and descends for a new load. For O- or O27-gauge track.

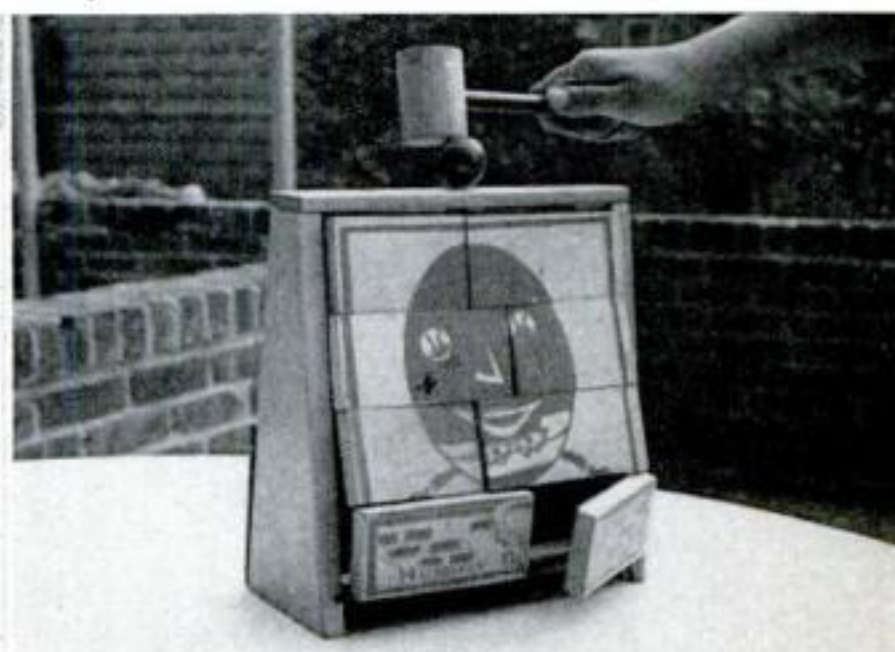


6. Kit-built model of self-propelled rail diesel car has electric motor connected directly to the drive wheels, as in a real Budd

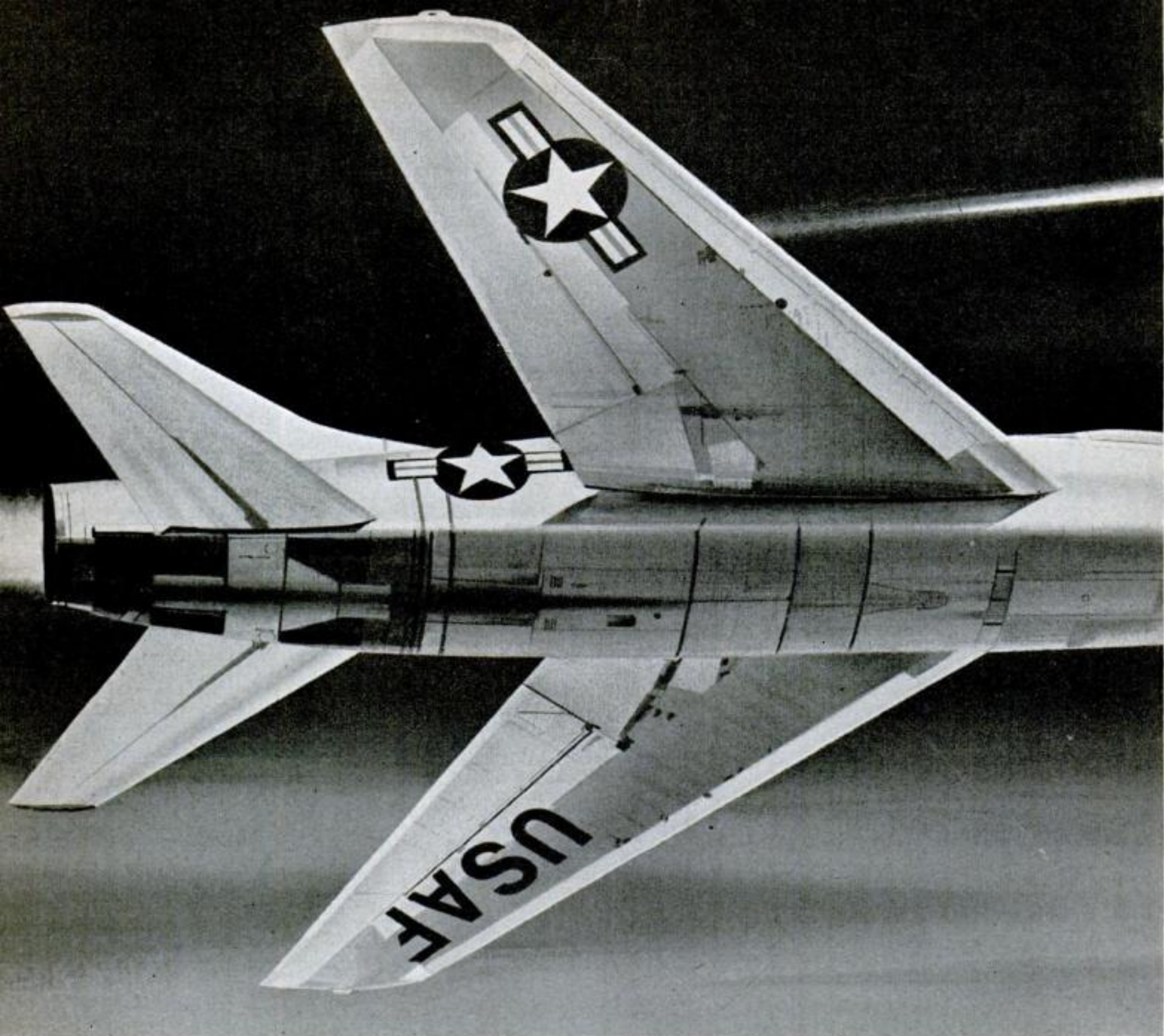
RDC. Ten inches long, it can haul three coaches. Truck and motor can be removed, serviced and reinstalled in two minutes.



7. The old tin whistle isn't tin any more and it does a lot more than whistle—it's an action toy, too. As a child blows into the mouthpiece, a tiny airplane makes a perfect loop around a plastic circle.



8. Tumble-down blocks channel destructive impulses into constructive building. A mallet knocks the stacked pieces apart. Children two to four can easily put Humpty Dumpty together again for another whack.



More jet power, more sweep of wing, and a low-drag fuselage make the F-100 the swiftest

With the F-100 Super Sabre jet now in production,

By Herbert O. Johansen

THE "Y" has been taken off the North American YF-100 jet fighter.

That means it is no longer experimental, that the U. S. Air Force now has in production the world's fastest fighter—one that can *sustain* supersonic speed in level flight.

We—and the British, and probably the Russians—have for some time had jets that were *capable* of faster-than-sound flight in dives accompanied by the sensational sonic bangs or, perhaps, in brief supersonic bursts boosted by jet

afterburner. But the F-100 is a new breed of plane—it is supersonic in level flight. It is built and powered for supersonic flight as routine operation—not just as a stunt or an all-out record-setting, headline-making effort.

A Whole Supersonic Air Force

The F-100 is a milestone, marking the coming-of-age of the jet age—the first in a series of new faster-than-sound fighting airplanes. Among these are the Air Force's McDonnell YF-101 twin-jet Voodoo long-range bomber escort; the Convair YF-102 delta-wing fighter; Republic's



fighter plane in our air arsenal.

the Air Force gets a truly supersonic weapon.

XF-103 research fighter and YF-105 fighter-bomber; Lockheed's YF-104; and for the Navy, the Douglas XF4D-1 Sky-ray delta-wing fighter (which in recent tests flew faster than 760 m.p.h.), the Grumman XF10F-1 Jaguar variable-sweep-wing fighter, and the McDonnell XF3H-1 Demon.

Some of these newcomers have been flown, some are being built and others are still on paper. Some may not get into production as better and faster models develop from lessons learned. But as the Ys-for-experimental drop off, our military air forces become truly supersonic. A

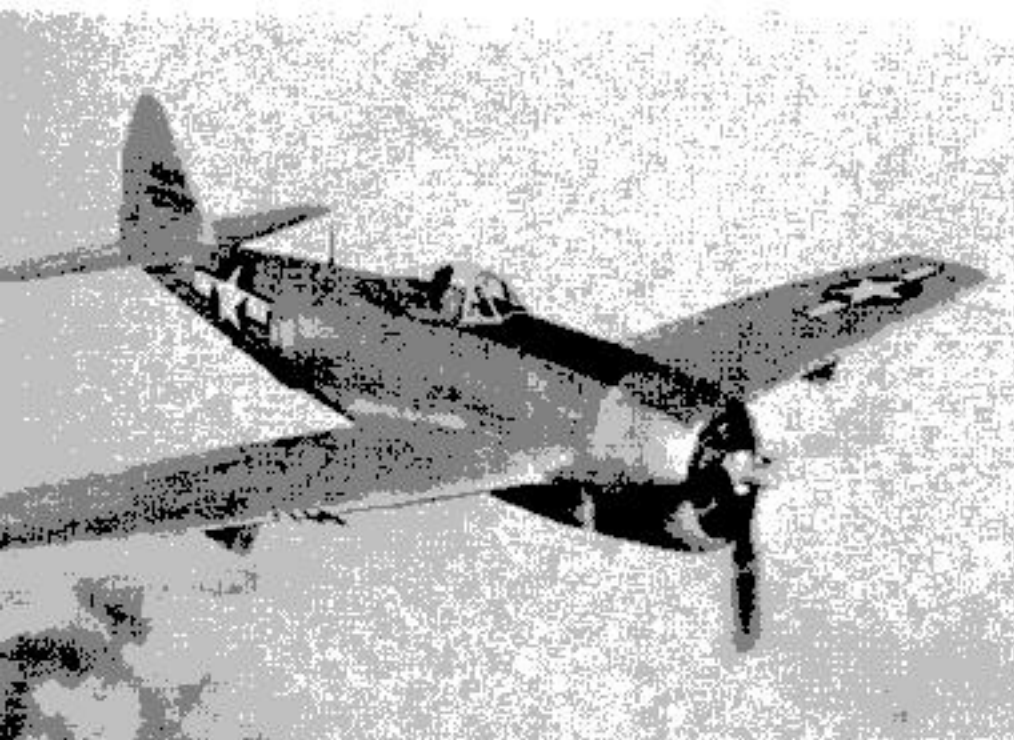
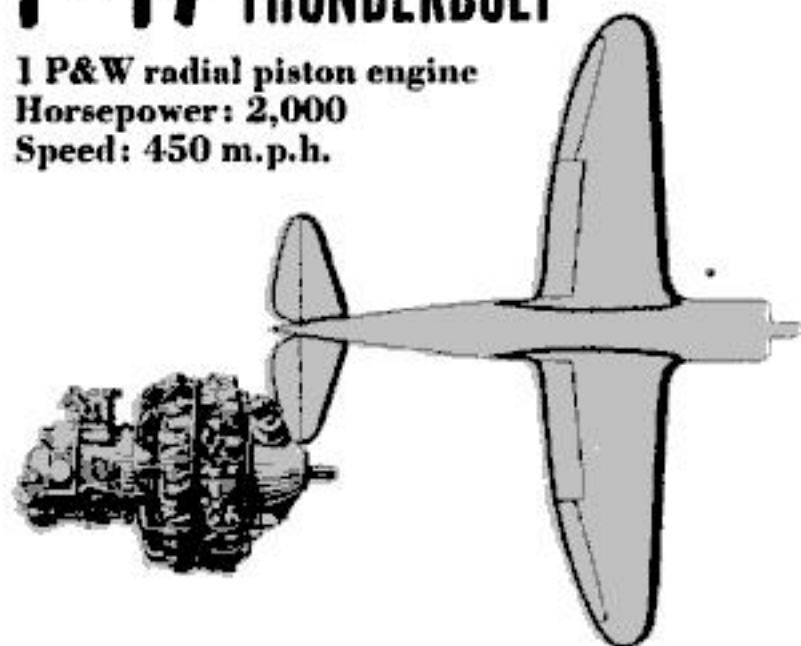
This Is the Fastest Fighter in the World



BIG INTAKE at nose lets F-100 gulp vast amount of air needed for supersonic speed.

P-47 THUNDERBOLT

1 P&W radial piston engine
Horsepower: 2,000
Speed: 450 m.p.h.



THICK, STRAIGHT WING, stubby nose, protruding guns, bulging canopy of World War II Republic Thunderbolt would have acted as drag brakes at speeds that jet makes possible.

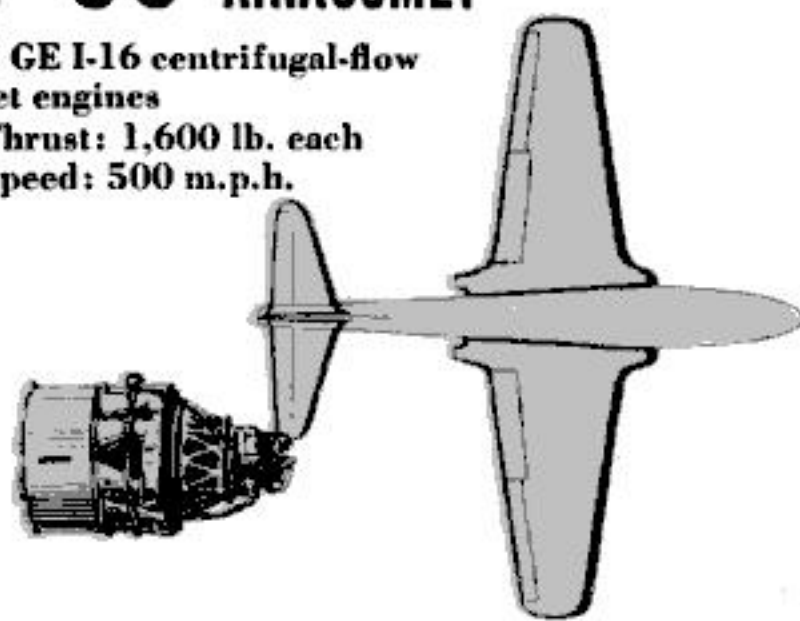
daytime fighter, the F-100 is a gun platform. Its main mission is to destroy enemy fighters over enemy territory to give us not only air superiority but the *control of the air* we would need during those last critical miles as an A-bomber neared its target. For that job it must be able not only to fly high and fast, but for long distances, which means great loads of fuel. So it is big; and, since it is big, it can carry under-wing loads of bombs or rockets for a secondary mission as a low-level air-ground attack weapon. Such external loads would necessarily slow the plane down, but once the load was dropped, the F-100 could fight its way back to base at supersonic speeds.

More Wing Sweep Increases Speed

Although it is an evolution of the F-86 Sabrejet that has broken many speed

P-59 AIRACOMET

2 GE I-16 centrifugal-flow jet engines
Thrust: 1,600 lb. each
Speed: 500 m.p.h.



JET POWER made its U.S. debut in this Bell P-59 Airacomet that first flew in October 1943. Absence of propeller enabled designers to clean up the fuselage.

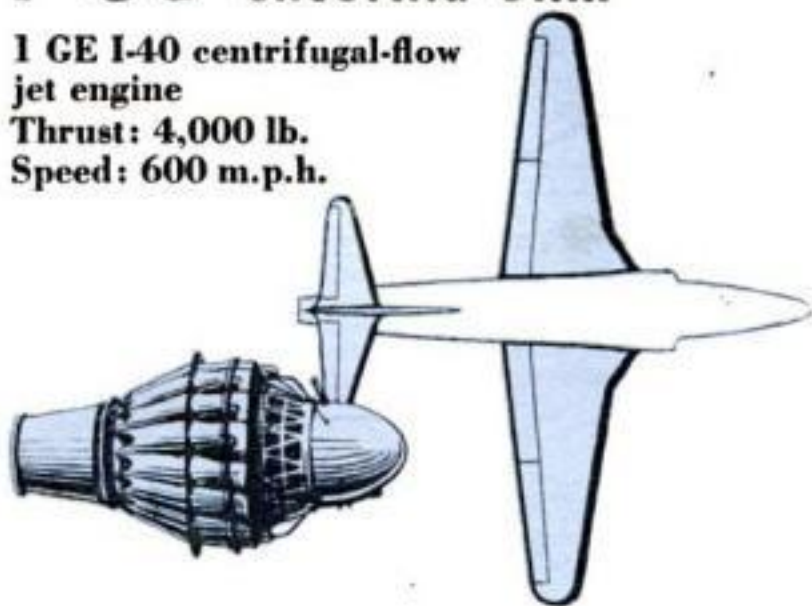
records and made aerial-combat history over MIG Alley in Korea, the F-100 Super Sabre is a new plane. That it is supersonic would mean that it can fly faster than sound at all altitudes, which varies from 660 miles an hour at a combat altitude of 40,000 feet to 762 miles at sea level. Bigger than the F-86 fighter, the F-100 is 45 feet long and weighs more than 20,000 pounds.

Most notable change is in the wing. Where the latest F-86 has 35-degree sweep, the F-100 has a thinner wing that is swept back 45 degrees. The tail also has more sweepback.

Power behind the F-100 is a new design in jet engines, the split-compressor J-57, claimed by the manufacturer, Pratt & Whitney, to be the most powerful production engine in the world. With it, the Super Sabre is reported to have more

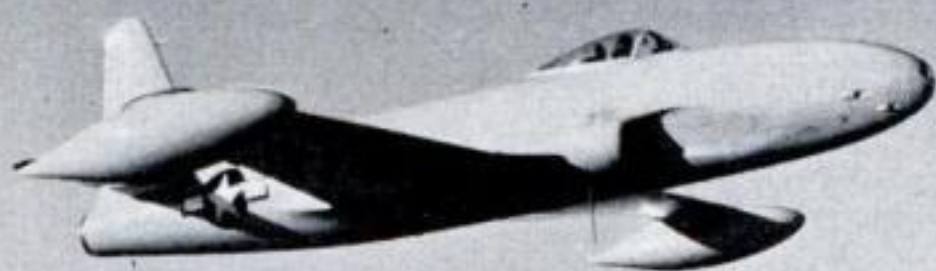
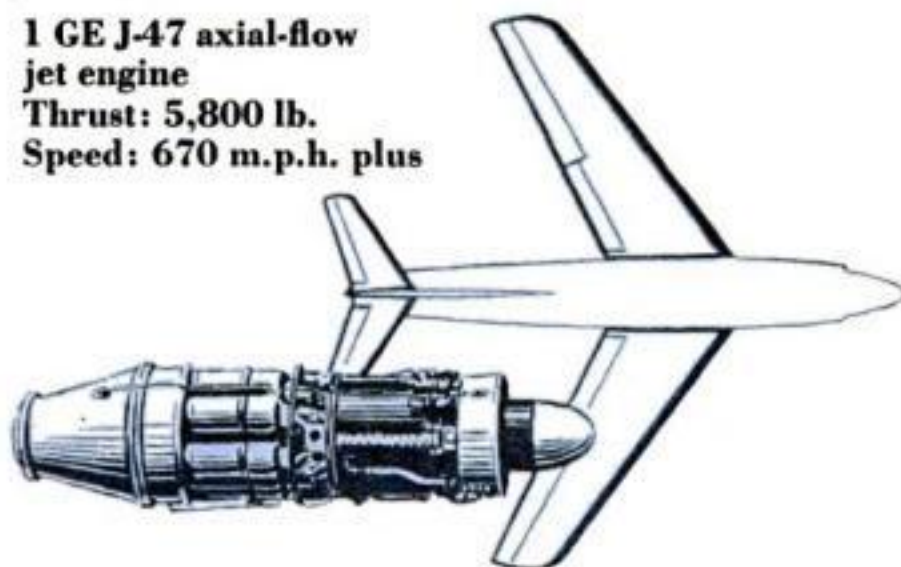
F-80 SHOOTING STAR

1 GE I-40 centrifugal-flow
jet engine
Thrust: 4,000 lb.
Speed: 600 m.p.h.



F-86 SABREJET

1 GE J-47 axial-flow
jet engine
Thrust: 5,800 lb.
Speed: 670 m.p.h. plus



FIRST OPERATIONAL JET FIGHTER, the Lockheed F-80 Shooting Star, met Red MIGs in combat in Korea. Although the wing is still straight, it is much thinner for less drag.



AS MORE POWERFUL JET ENGINES enabled planes to nudge the speed of sound, designers were forced to sweep back the wings, as in this North American F-86 Sabrejet.

than 10,000 pounds of thrust and about 15,000 pounds with afterburner (the F-86D has 7,600 pounds of thrust with afterburner).

Split-compressor, or twin-spool, means that an engine has two compressors in series, each driven by a separate turbine. There are two shafts with no mechanical connection between the two turbines. The first (low-pressure) compressor feeds the second (high-pressure) compressor. The result is a higher range of compression ratios than can be obtained on a single-shaft compressor.

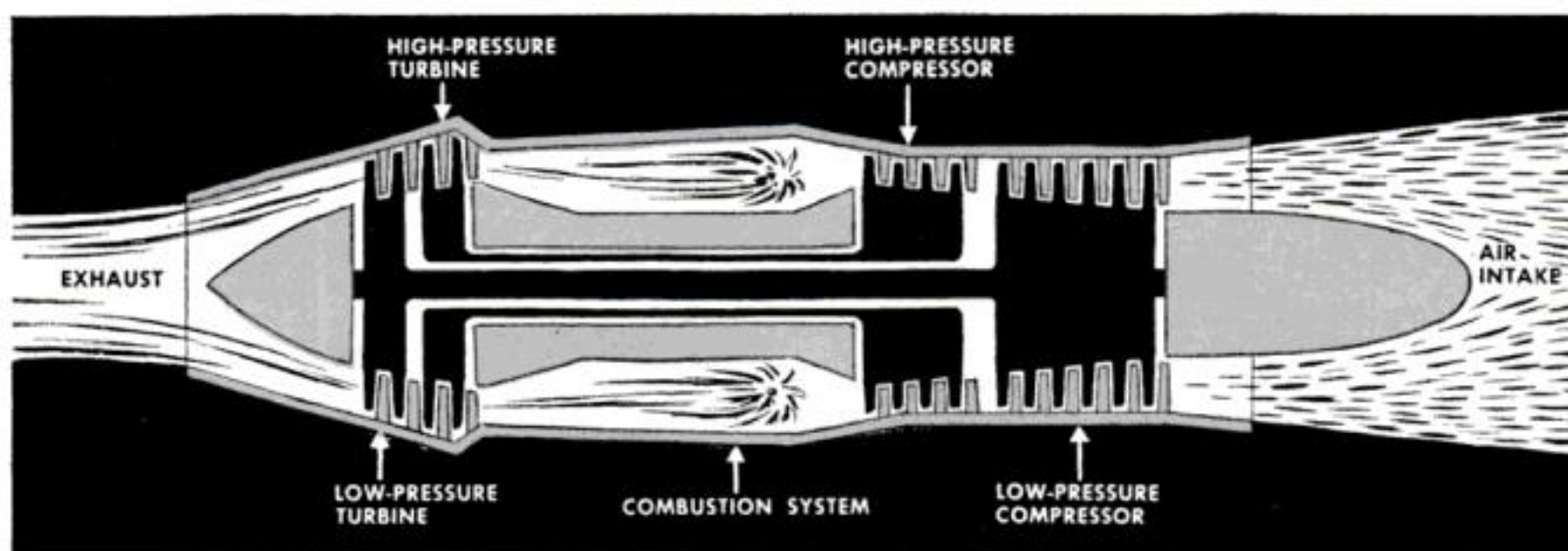
Jet Speeds Bring New Designs

Among the advantages of the split-compressor are lower fuel consumption for range or higher power output for speed and maneuverability; the elimination of "surging," or back-flow, problems

in the thin air at high altitudes; easier starting, and fast acceleration.

As jet engines became more powerful, new fuselages and wings were designed around the engine, and the early Lockheed F-80 Shooting Star and the Republic F-84 Thunderjet were born. Wings were still straight, but streamlining sent speeds up 100 and more miles an hour. Then jet-engine power went up and greater speeds forced the designers to go to thinner and swept-back wings to delay drag and the turbulence that wings run into at transonic speeds.

Ever-increasing jet speeds have posed other problems. When our first jet plane, the experimental Bell P-59 Airacomet, was announced in 1944, the Air Force thought it had the makings of a simple, lightweight fighter that would burn almost anything as fuel. Kerosene was it—



Principle of split-compressor jet engine that powers the F-100 is shown in drawing above.

at first. Disillusionment came fast—as fast as speeds increased. Jet engines had to abandon kerosene for gasoline, and today that has had to be replaced by special, high-grade JP fuels.

Then there was the matter of weight. After all, a jet plane is only a shell built around a blowtorch. Nothing complex about that. But again, greater speeds and more powerful engines changed the picture—there was the pilot to consider.

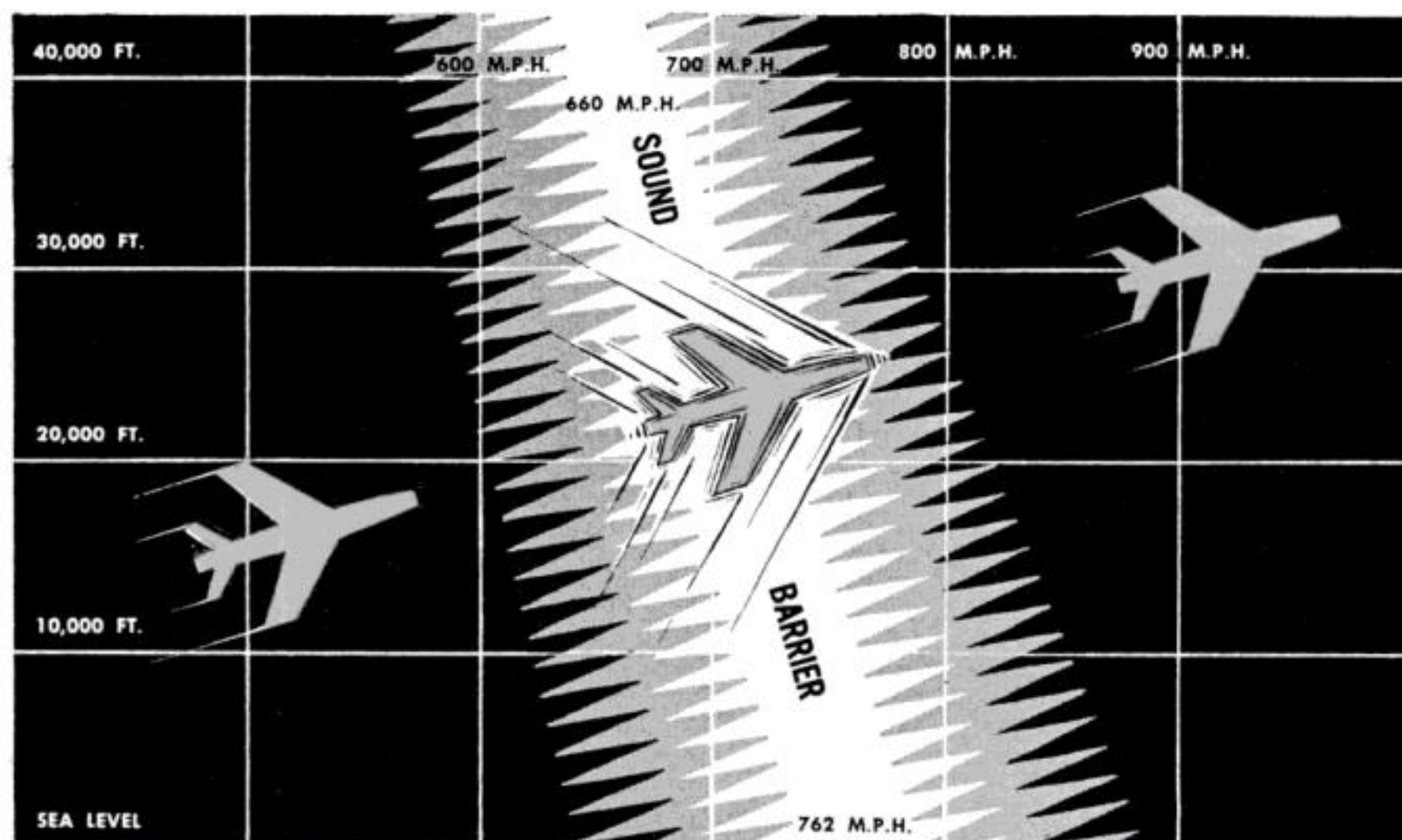
Pressure suits enabled him to take the terrific Gs at jet speeds, but he must also fly and fight at high altitudes to take advantage of lower fuel consumption. That meant a pressurized cockpit and an im-

proved oxygen system to keep him alive should the pressurization fail.

Heat created by friction necessitated refrigeration of the cockpit, and because it is bitter-cold up there, heaters had to be provided to prevent guns from freezing. Add to this an ejection seat for the pilot in case of bail-out, computing radar gunsights and power controls, and you have what is mildly called "complexity."

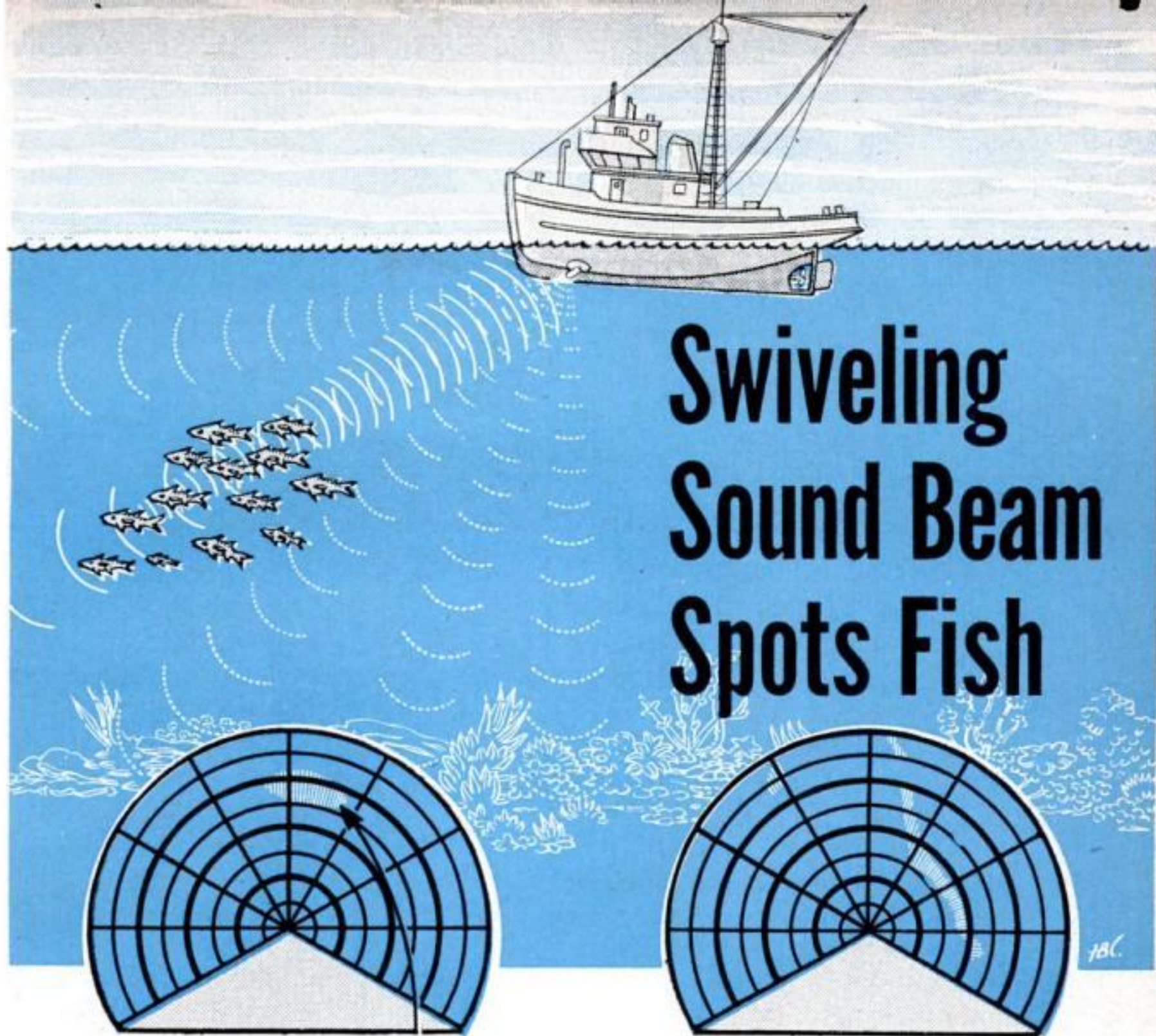
Now that the Air Force has hit the supersonic, the question arises, "How much faster will we fly?"

Top fighter men in both the Navy and the Air Force say, "At least 100 miles an hour faster than the enemy." **END**



SPEED OF SOUND varies with altitude. Critical speed area is the transonic where the air-

frame runs into violent turbulences. At supersonic speeds air becomes smooth again.



Swiveling Sound Beam Spots Fish

A SCHOOL OF HERRING looks like a football on Sea Scanar's screen. This school is 150 feet down, 10 degrees to starboard.

OUTLINES OF A CHANNEL detected by Sea Scanar. Screen indicates 240-degree scanning range, but beam's automatic swing is 180.



UNDERWATER "SEARCHLIGHT" that can shoot narrow beams of sound waves to port and starboard, up and down, protrudes from hull. Hoist raises it into a well when not in use.

A NEW type of sonar, sweeping the sub-surface like a searchlight, probes the dim depths ahead and on both sides of a ship as well as beneath it. Sonar units of earlier design have been able to beam their tiny, rapid bursts of high-frequency sound in only one direction—straight down. This has limited their usefulness.

Sea Scanar, as the latest sonar is called by its makers, Minneapolis-Honeywell, has already been tried out with considerable success by professional fishermen. And it is expected to become an important navigational aid as well.

The echoes it receives as its beams of sound waves hit fish, floating logs, reefs, piers and sand bars are visible on a radar-type screen and audible in a loudspeaker. A fish sounds different from a sand bar, a reef from a log.

Sea Scanar is so sensitive that it has picked up the faint, bubbly trail of a line of swimming ducks at 400 feet.

Plug-In Workman Built in 90 Days

Garco, newest in a long line of man-made men, can do homely tasks now but is cut out for more dangerous duties.

By Andrew R. Boone

GARCO, a mechanical man recently "born" in a California garage, can saw, hammer, drill, mix chemicals, pick up papers, stack boxes, roll his eyes and have the shakes. He can also play chess.

In this last accomplishment he resembles a sensational robot of about 200 years ago. That celebrated member of the ancient mechanical family, dressed like a Turk, was the rage of Europe. He played chess with Catherine the Great, Frederick the Great, Benjamin Franklin and Napoleon. He even had the temerity to sweep the board clean after Napoleon had made three wrong moves.

Years after these worthies were dead and gone, some bright-eyed boys discovered that a small, skinny, unmistakably human man hid out in the boxlike chest under the chessboard and worked the levers that made the "mechanical" man seem so clever.

Made of Discarded Plane Parts

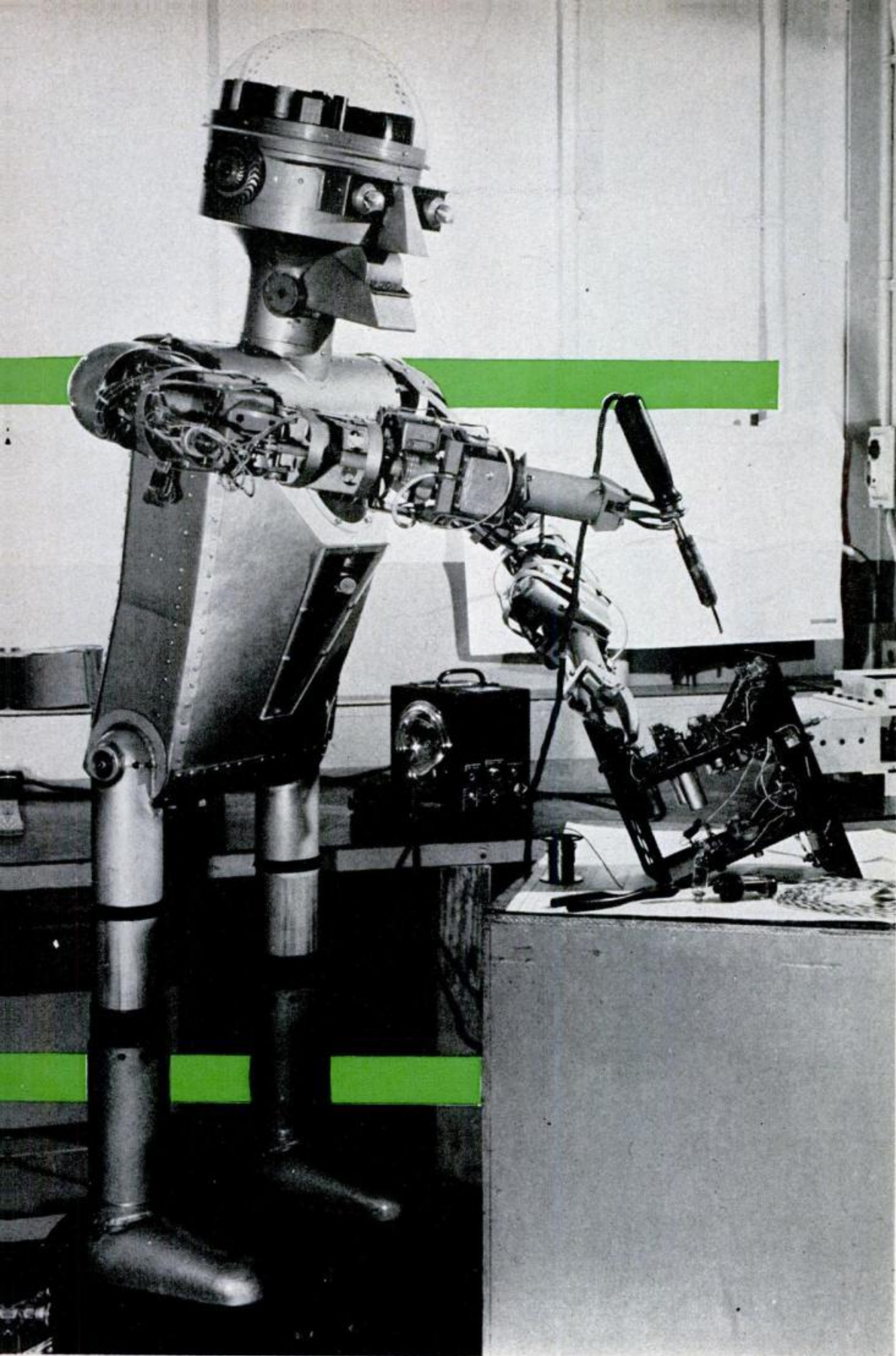
Garco, latest in a distinguished line of man-made men, is a lot cleverer than this fraudulent Turk, but he needs human direction, too. He gets it, through a control arm and push buttons, from

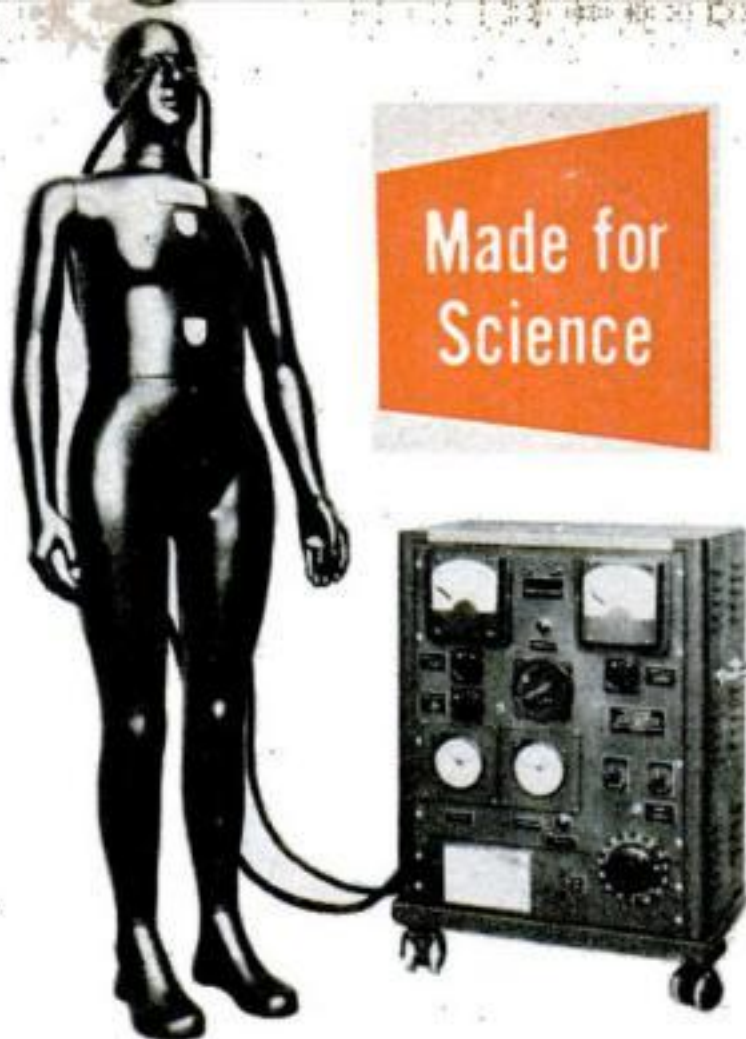


HOW GARCO SOLDERS and does other chores is shown here. His right arm duplicates each movement of the mechanical arm that his creator, Harvey Chapman, is seen manipulating above. His left arm is worked by push-button controls.

Harvey Chapman, an engineer for the Garrett Supply Co. of Los Angeles, Calif. Chapman created Garco in three months, in his garage. The 90-day wonder was put together and made animate with discarded airplane parts.

Garco is a well-oiled creature of Convair gear trains, Constellation electrical actuators, and DC-6 cabin-pressure regu-

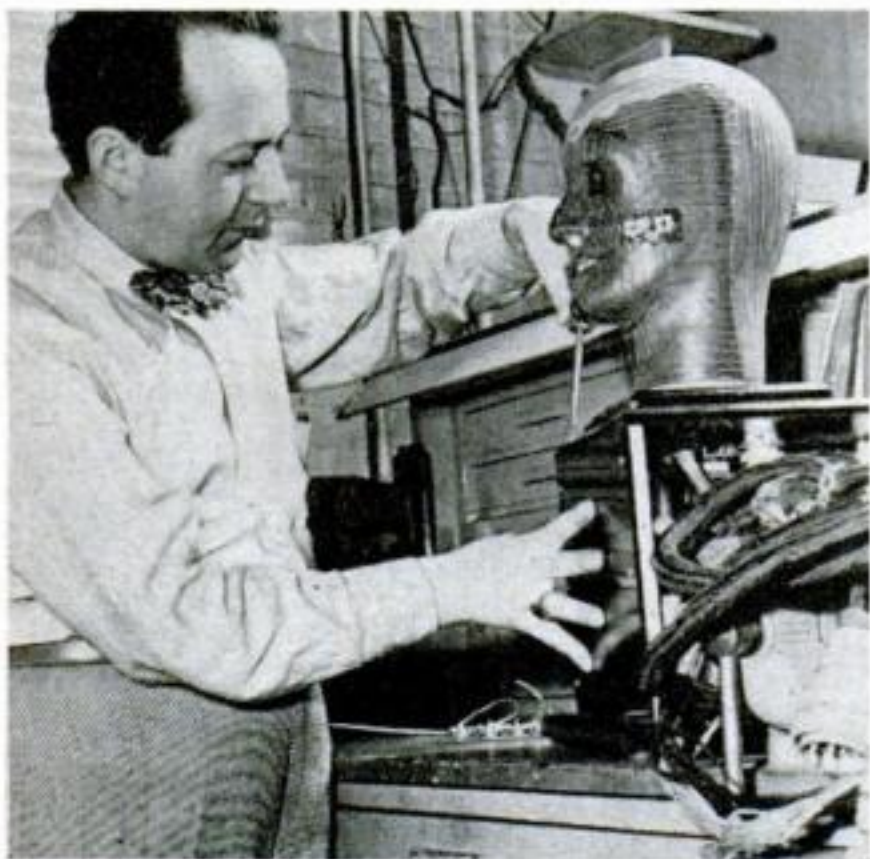




"SLEEPY JOE," electrically heated copper man made by GE, tests flying suits for Air Force.



"RED FREDDY," built by the Navy, bleeds dyed water in four places to help teach first aid.



ANONYMOUS HEAD, made by GE to test oxygen masks, heats up, sweats and breathes.

lators, plus electronic circuits and enough sheet metal to make him decent. With the aid of a vacuum applied through his rubber-tipped fingers, he can pick up light objects with commendable delicacy. His brain is electronic, a neat accumulation of six aircraft servo systems. His nervous system consists of 1,200 feet of wire cable. A two-way radio transmitter enables him to make pertinent remarks.

Chapman brings Garco to apparent life by first opening the circuits and sending electricity surging into the complex metal body. He then lays his right arm along a five-jointed electromechanical control arm, which has a handgrip at the end of it. The joints can be moved up and down, in and out. As Chapman twists and turns his own arm—and the control arm along with it—Garco's right arm moves in exactly the same way. Garco is so sensitive, in fact, that if Chapman's hand shakes, Garco's does, too.

Electronic Miracle

What happens is a minor miracle of electronics.

As the joints in the control arm move, through six electric channels they notify sensing devices in Garco's electronic brain that they have disturbed the balance in as many Wheatstone-bridge systems. The disturbance of each fires an electronic tube, which in turn fires a relay tube, which actuates one of the five .05-horsepower motors in Garco's right arm.

So much for the right arm. Garco's left is manipulated by 22 push buttons, mounted on the case of the control arm.

The push buttons, in addition to working Garco's left hand and arm, move the robot's jaws and lips, increase his height six inches, roll his plastic eyes and enable him to bow at the hips.

Both of Garco's arms contain five tiny actuator motors. Three apply torque, representing the ball joints of a man's shoulder and elbow; the others, taking the place of tendons, apply linear push and pull.

Most of the mechanical men of history—and they go all the way back to Daedalus, who, if we can believe Plato, created statues that had to be tied down to be kept from running away—have been built as stunts.

About the only exception was a fabulous man of clay that Albertus Magnus, back in the thirteenth century, spent 30 years putting together. When he got through with it, the creature supposedly was able to walk, talk, answer questions intelligently and solve problems. But Thomas Aquinas, a pupil of Magnus and a youth with a wholesome fear of the Devil, attributed the clay man's gifts to the Evil One, and smashed it.

Magnus apparently was a man of awesome self-restraint. All he is reported to have said was, "There goes the work of 30 years!" But he said it in Latin, and the report may have gotten garbled.

Almost all other recorded mechanical men have been built to amuse and amaze the public and, directly or indirectly, make money for their creators.

Robots for Science

In recent years, however, some have been built for scientific purposes.

General Electric, for example, developed an electromechanical head for testing oxygen masks at sub-zero temperatures, and a mechanical hand for fiddling with "hot" materials at Hanford and other AEC plants.

What's the justification for Garco? Well, he started out as a stunt, too. But Chapman thinks he should be taken a lot more seriously than that.

Why not, he asks, use creatures like Garco to do a lot of the highly dangerous but necessary jobs that more perishable men now do? For instance: mix the ingredients for experimental explosives, handle deadly bacteria and fungi, weld and salvage under water.

Robots of Garco's stripe, Chapman suggests, could also braze titanium in a vacuum, work under any degree of atmospheric pressure, handle radioactive stuff—even pilot the first rocket to the moon.

END



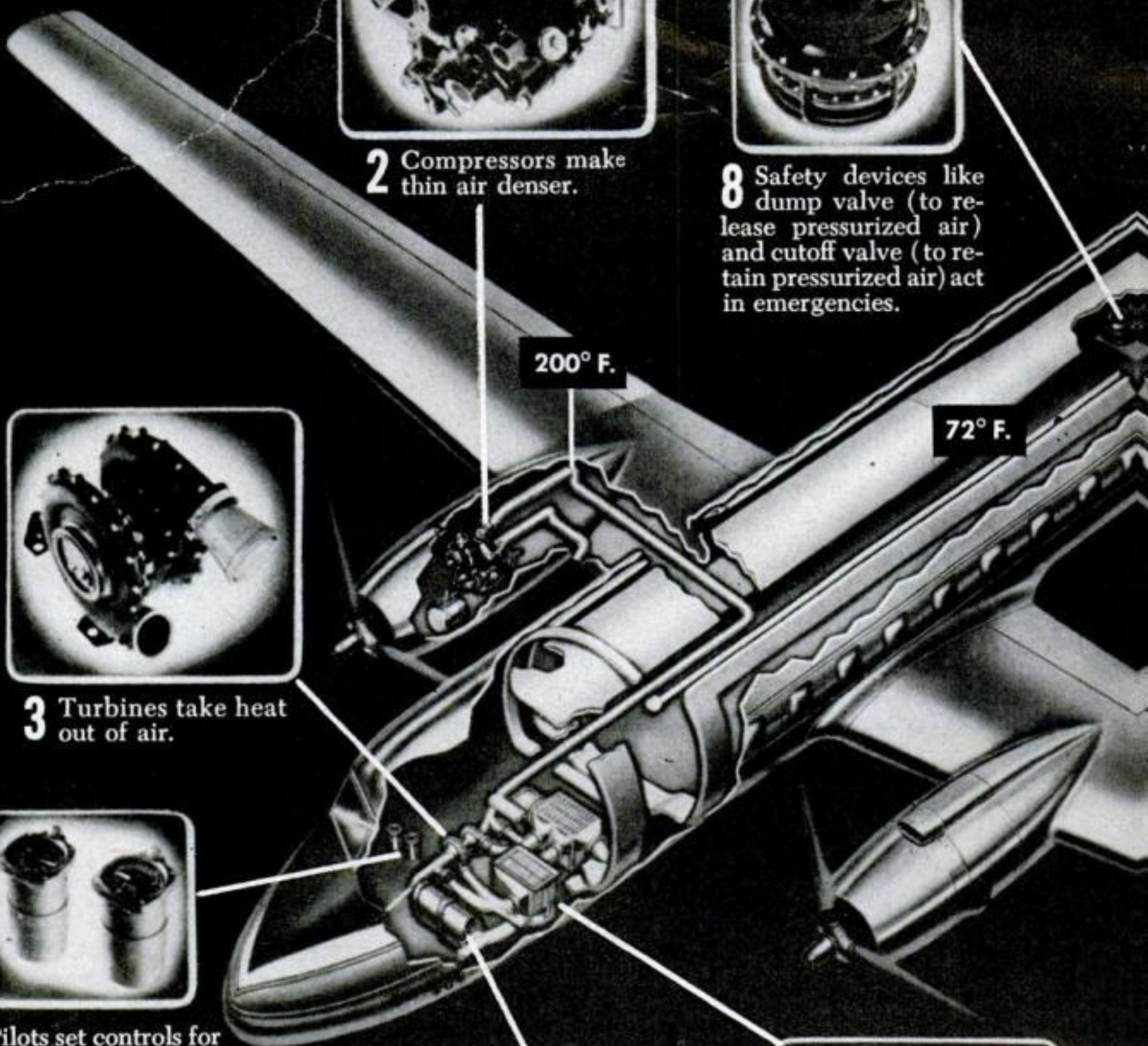
COLD-HEARTED SIREN, run by electric mechanism and radio, haunts Minnesota river.



QUARTER-TON ROBOT, directed by radio, manages to ruffle a German cab driver.



HAND-CRANKED BUGLER, made in Germany in 1810, reveals bellows that made him toot.



2 Compressors make thin air denser.



8 Safety devices like dump valve (to release pressurized air) and cutoff valve (to retain pressurized air) act in emergencies.



3 Turbines take heat out of air.



1 Pilots set controls for cabin altitude and rate of change.

200° F.

72° F.



5 Water separators remove moisture.



4 Heat exchangers cool air more.

AN AIRLINER'S pressurizing system has three major parts—controls, air-compression and distribution components, and safety devices. Pilots set dials for altitude where system will start operating and for rate of change. Temperature control is set like home thermostat.

Compressed air from turbines is forced to

turn the cooling turbines which rob it of heat. Heat exchanger, bathed by outside air, cools captive air even more. Moisture is removed from it by centrifuge, baffles or filters. Rate of change in pressure is regulated by diaphragmed bellows, responding to difference between pressure of outside and in-

How You Fly High in Comfort

ALL over the world each day tiny islands of pressurized air float around in a vast sea of atmosphere too thin to sustain human life. These are the cabins of modern airliners, flying from four to eight miles above the earth.

The airliners are pressurized automatically. They are depressurized automatically for landing. The crews dial what pressures and rates of pressurization they want. A big family of mechanical and electrical gnomes do the work.

The gnomes even react to emergencies. If the depressurizing system should fail on landing at mile-high Denver, for instance, passengers could be blown out the door as the locks were unfastened. But a gnome on the landing gear spills the high-density air from the cabin.

Another gnome retains pressure in the cabin if the pressurizing system gets out of order. Still another heats or cools the air as passenger comfort demands.

One of Several Systems

Pictured here is a typical airplane pressurizing system. Several systems are in use. This one is made by the AiResearch Manufacturing Co. of Los Angeles. Among its components is a slipping clutch borrowed from the Ford automobile's automatic transmission.

Pressurizing systems are complicated, but their principle is simple. A turbine-type compressor, engine-driven, takes the thin air at high altitudes and thickens it. In the process, the air gets hot. So, depending on temperature demands for passengers and crew, it may have to be cooled. It's also dehumidified.

The next time you fly and escape the discomfort of having your ears "pop" when you land, credit the gnomes of the pressurizing system.

END

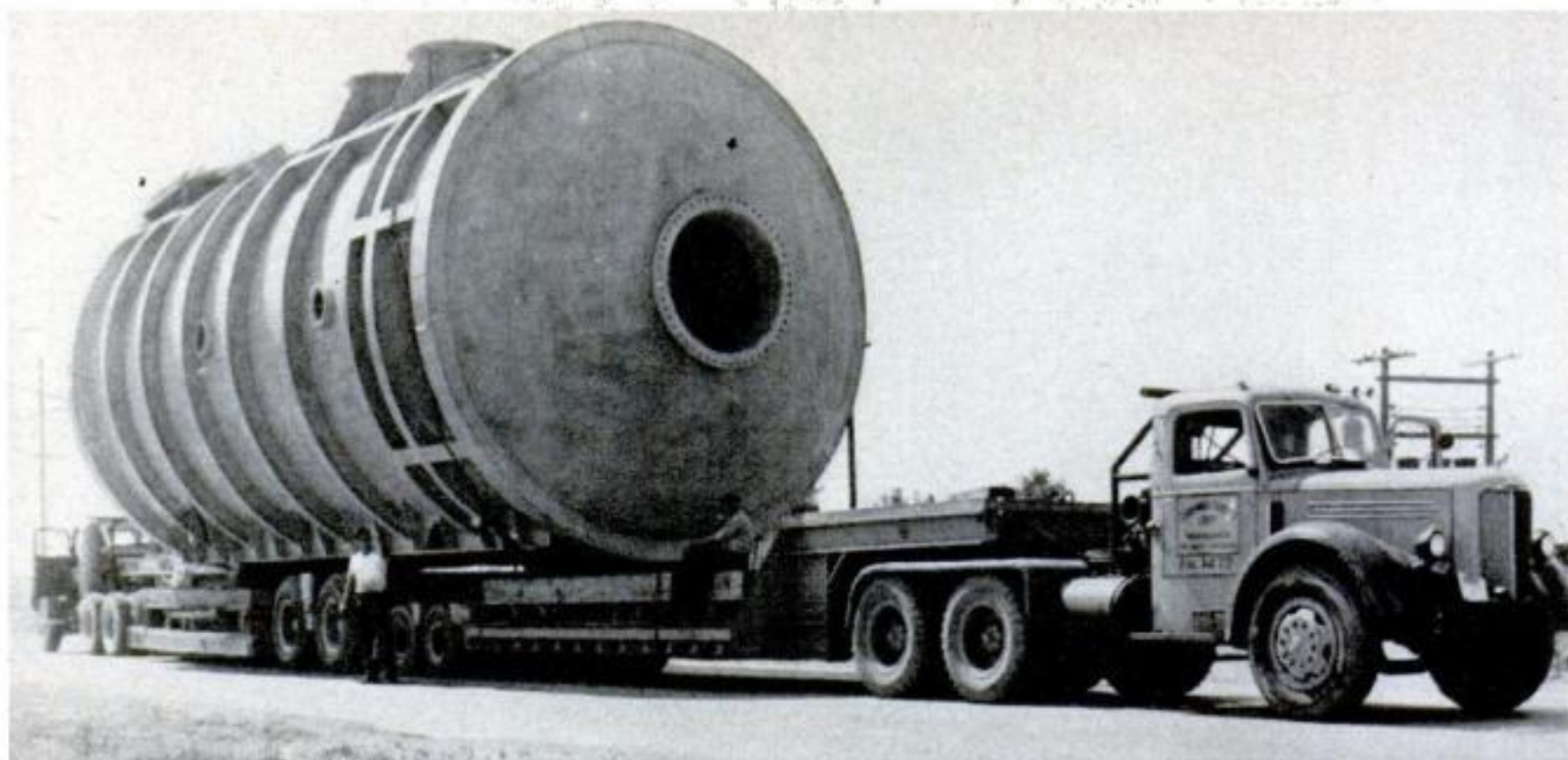
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6 Pressure switch, sensing difference between outside and inside air, governs rate at which pressure builds up or is released.

7 Pressure regulator governs amount of pressurization.

side air. It sends commands by electric circuit to regulator valves. Amount of pressure is regulated by bellows-and-diaphragm or spring-loaded valve sending electric signals to a pressure-limiting valve. System shown uses auto-type slipping clutch in compressors to change rate at which air is pressurized.



Moving Day for 117 Tons Has Tractors Working Back to Back

WHAT looks like a huge water tank loaded on the trailer above is a 48½-foot-long, 117-ton test cell for putting jet engines through their paces. Two Mack tractors with six

wheels each—one pushing, one pulling—and a pair of heavy-duty low-bed trailers hauled it through Indianapolis streets to deliver it to the Allison plant.



Steering Post Bends Up in Crash

A NEW French steering column is intended to cut the chances of smashed ribs in car collisions. When the driver is shoved forward, the pressure pushes the wheel forward, too, until the swivel-jointed column is upright as shown above. The movement also automatically cuts off the ignition.



How Many Fleas on a Squirrel?

THE squirrel above is being de-fleaed to test a parasite-killing insecticide. Any bugs the vacuum cleaner misses are gathered with tweezers—and the count shows how good the flea-killer is. The College of Medical Evangelists, Loma Linda, Calif., is running the tests for the Army.



1 MARKER BUOY FROM
SUB BREAKS SURFACE

By Bill Kreh

Event One Thousand!

*When a sub lies helpless on the sea bottom,
men with the diving bell rush to the rescue.*

2 DIVER DESCENDS TO
SECURE GUIDE LINE

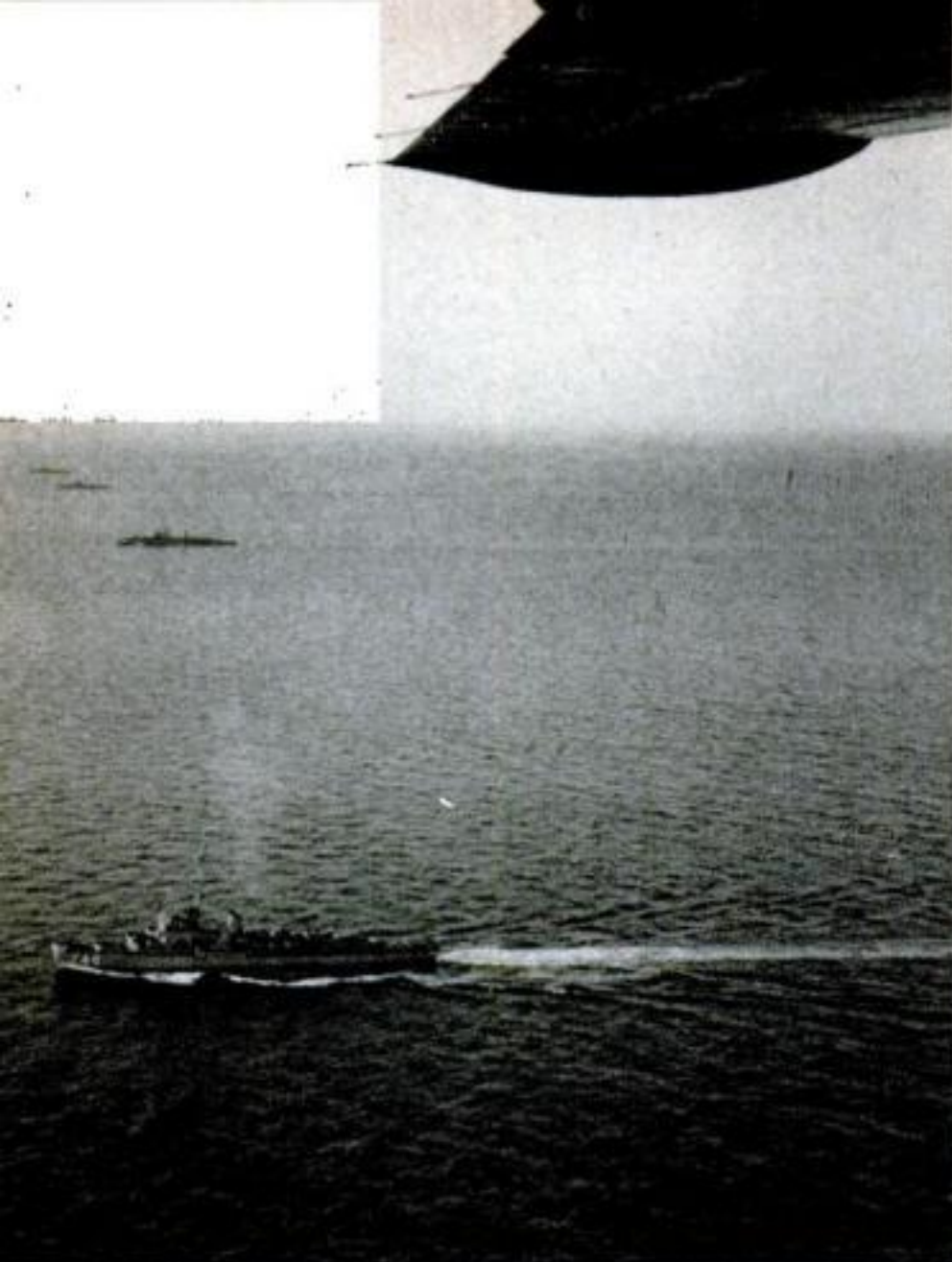
3 DIVING BELL IS LOWERED
ONTO SUB'S HATCH

INSIDE the radio shack of the submarine tender USS *Gilmore*, at Key West, Fla., a Navy radioman pounded out a message:

COMMENCE EVENT ONE THOUSAND X
SUBMARINE SENNET X LAST KNOWN
POSIT OFF AMERICAN SHOALS ON
COURSE 090 AT FOUR KNOTS AT 1900
X COMMENCE SEARCH X . . .

Three words in the message—EVENT ONE THOUSAND—meant that a sub-





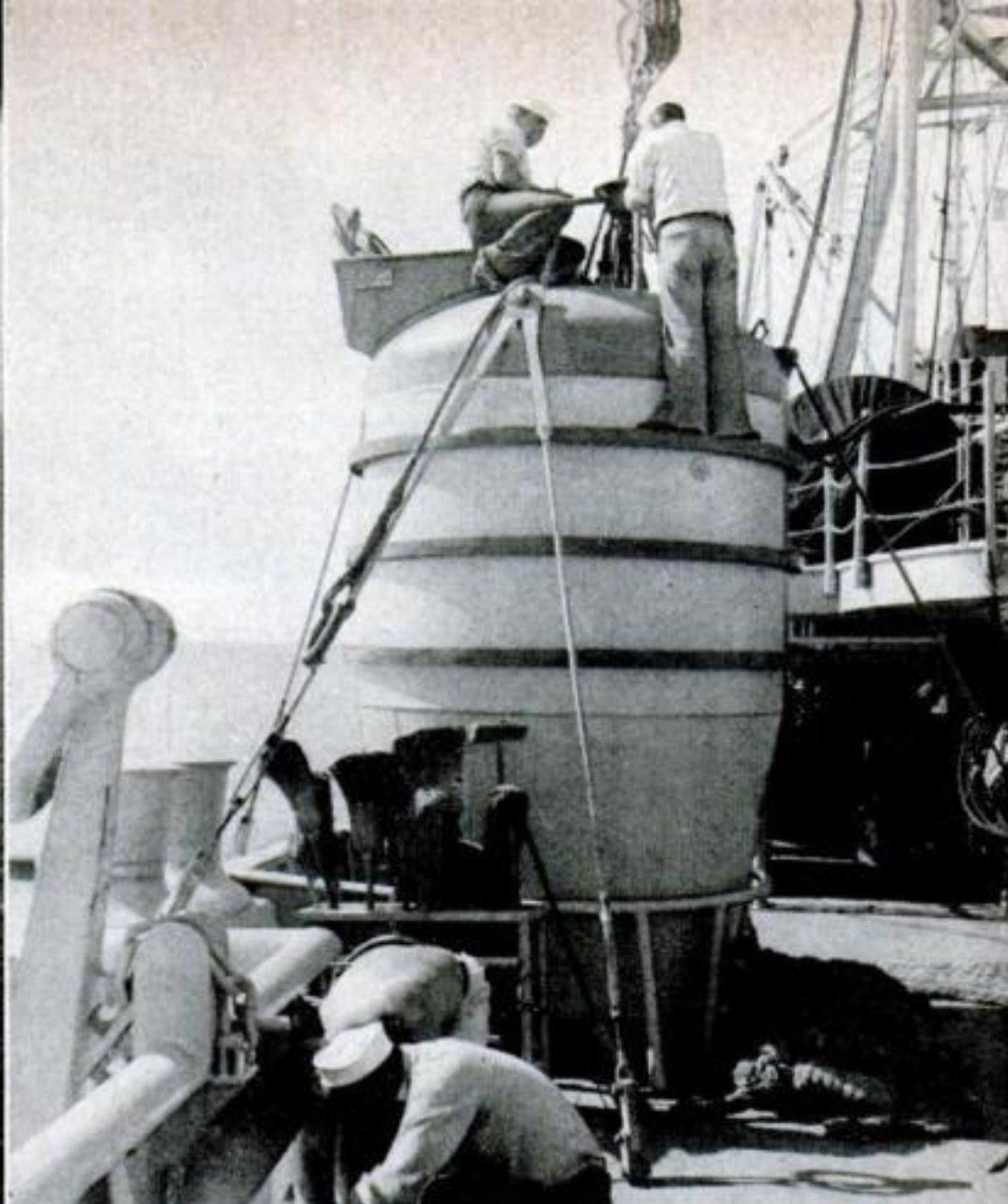
1 HUNT BEGINS in blue waters off Key West as surface ships search for submarine *Sennet* in EVENT ONE THOUSAND drill. A Navy blimp also participates.

marine disaster might be in the making.

The search-and-rescue sequence that the radio message set in motion is shown in the accompanying photographs.

This was only a drill, but no drill the Navy holds has more overtones of grimness than the search for a "missing" sub.

5 DIVING BELL is lowered into water from deck of *Petrel* before being cast loose for descent. Weighing 10½ tons, bell carries two crewmen, can rescue eight men at once.

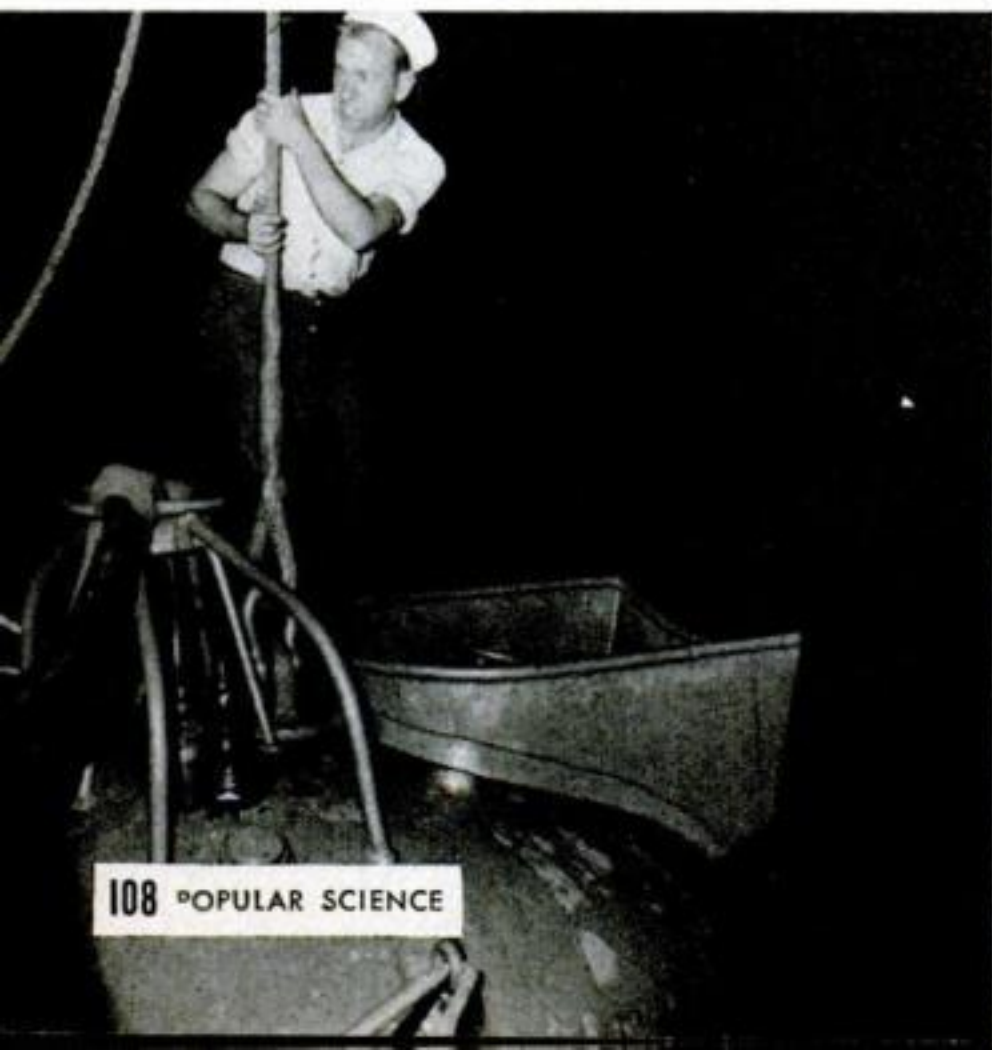


2 DIVING BELL, to be lowered onto sub's hatch, is prepared by crew of USS *Petrel*, submarine rescue ship. To give clue to location, sub emits noises.

Soon, aircraft, surface ships and even other submarines were off on the hunt.

Using the latest in sonar and radar, the search continued into the night. When a positive contact was made with the *Sennet*, the rescue vessel USS *Petrel* went into action. Nine hours after the

6 BELL is now secured to *Sennet*. One of "rescuers" from *Petrel* opens air lock in base and enters submarine through hatch. Bell can go to any depth a sub can.



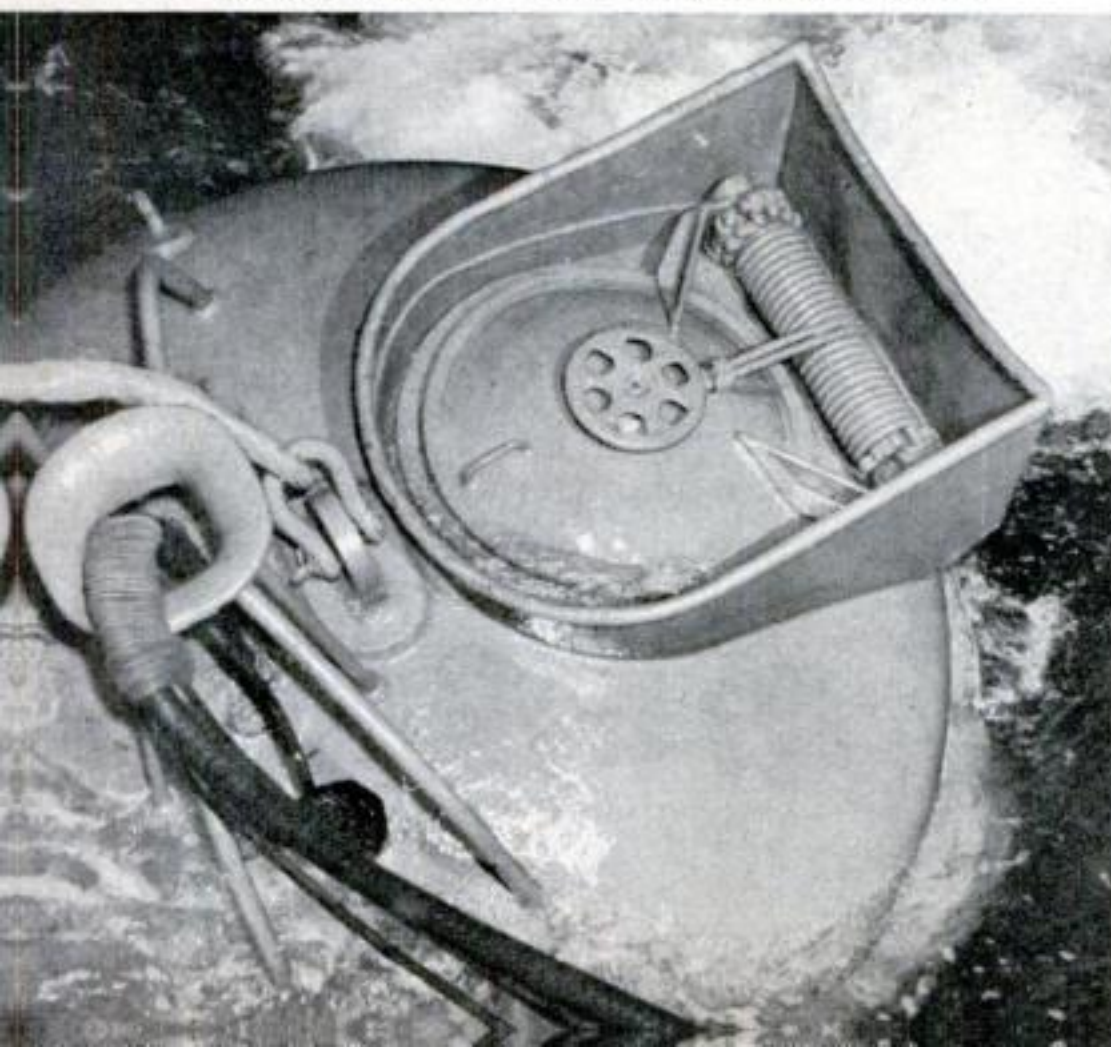


3 MESSENGER BUOY, sent up by *Sennet* to show position, is retrieved by *Petrel's* crew as first step in "rescue." Diver will follow buoy's cables down to submarine.

Sennet had been reported "overdue," her crew was "rescued."

Actually, as this was written the U.S. Navy hadn't made a real-life submarine rescue since 1939, when the *Squalus* sank off Portsmouth, N. H. Thirty-nine of her men were rescued, and the *Squa-*

7 BELL BREAKS WATER after being detached from sub to complete first round trip. Drill is precautionary. Navy has not had sub rescue job since *Squalus* sank in 1939.



4 DIVER is readied for plunge to ocean bottom. He will connect the other cables that will guide rescue bell to *Sennet's* hatch. Bell's buoyancy can be altered at will.

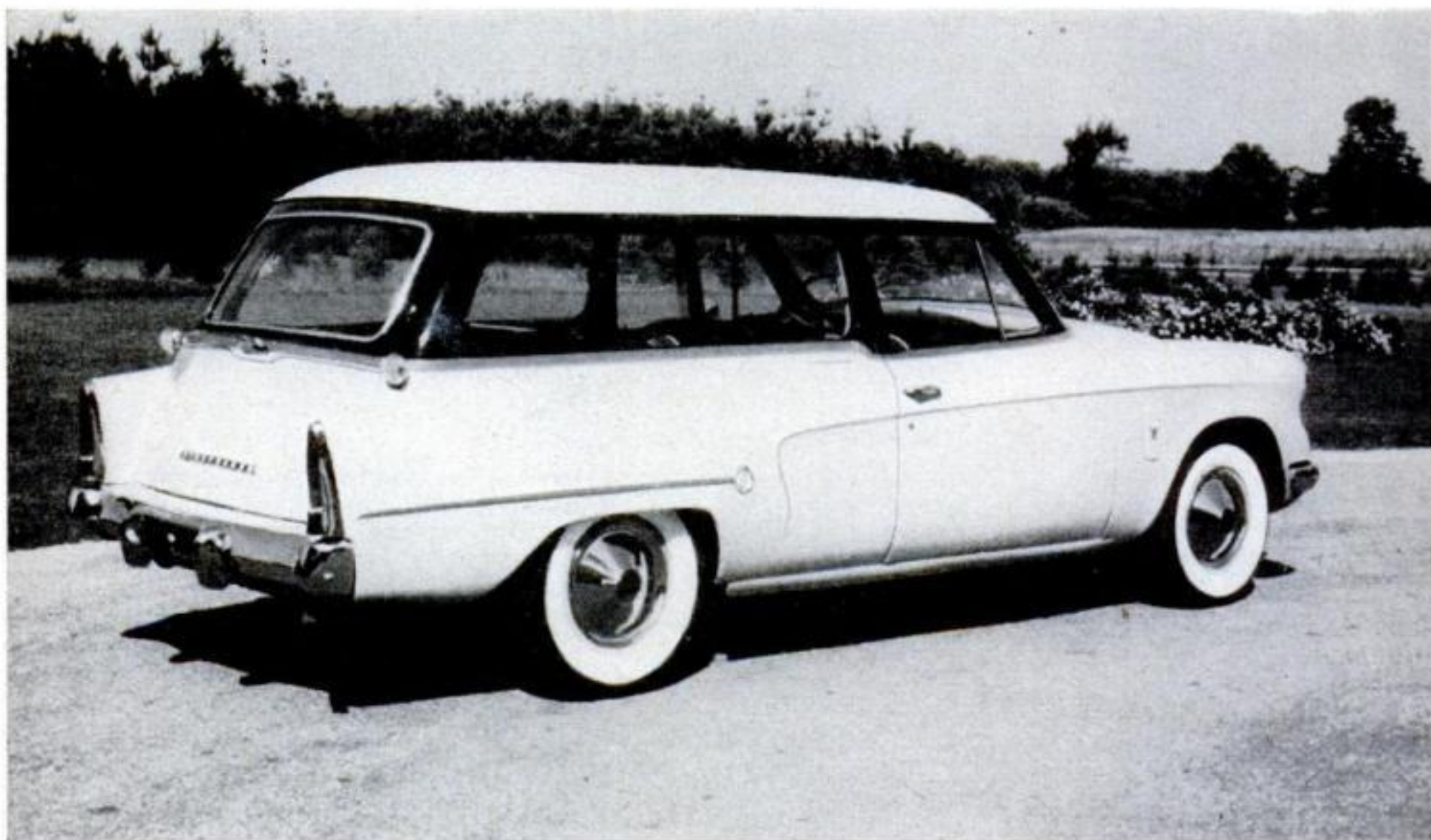
lus was raised to fight in World War II as USS *Sailfish*.

But as long as there's a submarine operating under the sea, there's the threat of sudden disaster. To meet it fast, the Navy keeps constantly in trim by drills like Event One Thousand. **END**

8 FIRST "SURVIVOR" from *Sennet* climbs out of diving bell. Submarine rescue vessels like *Petrel* usually are within easy sailing distance of any fleet of U.S. subs.



Studebaker Joins Wagon Train with 1954-Model Conestoga



*Better brakes, glossier interiors,
and a new entry in the hot station-
wagon fight, mark next year's line-up.*

By Frank Rowsome Jr.

STUDEBAKER is back in the wagon business that launched the company more than a hundred years ago. But the wagon they are making now is scarcely calculated to tote pioneers across the plains. This one lugs the kids to school, hauls plywood back from the lumberyard, and carries the whole family, including the pup, on vacation trips.

This latter-day prairie schooner, the company's bid for the growing market

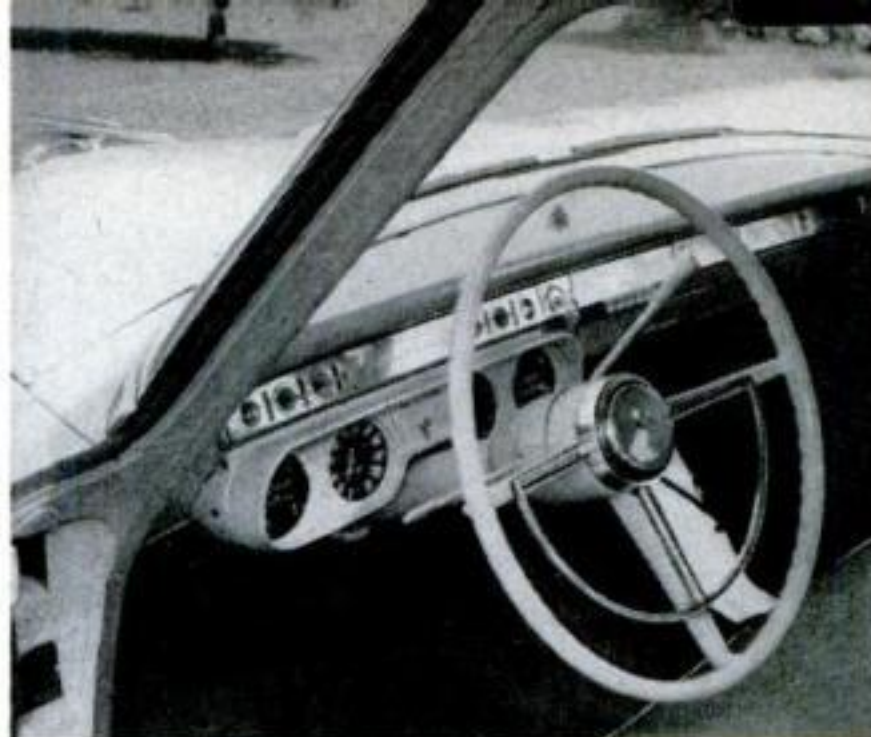
staked out by the Plymouth Suburban and the Ford Ranch Wagon, is called (more or less inevitably) the Conestoga. On looks, at least, Connie is a comer.

Loewy wagon. Up front, it has the same sloped, downhill lines that made the Loewy-styled 1953 Studebaker such a snaky, "Continental" craft. Beginning at about the door, the lines square out, blending into the same shape that characterizes most current station wagons—that of a miniature and rather sporty hearse. Pert little kickups of rear fend-

ers repeat the rear lines that helped make the '53 car such an eye-popper. For the lady of the house who wouldn't mind cutting a wider swath in suburbia, there are some juicy combinations of color and interior details, guaranteed to green the eyes of other matrons whose wagon interiors are finished in utility-gray fiberboard.

Never a company to let the gewgaws crowd out the gears, Studebaker has also built some solid service into its wagon. It is a two-door, two-seat vehicle, able to carry six persons plus some 32 cubic feet of payload. If you want more space, flip-flop the rear seat so it lies flush with the floor, which gives room for three people and 64 cubic feet of enclosed payload space. If you aren't exceptionally tall, you can spread a sleeping bag out on the 69½-inch-long rear floor. (If you're more than five-nine, try it kitty-cornered, or let your feet sleep out on the tail gate.)

Engineering the wagon. When the Conestoga project came up, Studebaker design people figured they might have to beef up their basic chassis. This turned out to be unnecessary (one exception: frame steel on the six-cylinder job is going to be a few thousandths



INSTRUMENT PANEL is redesigned with a single shroud over instruments, and has new flat switch toggles. Interior colors and fabrics are going to be extra-luxurious this year.

thicker). The wagon's dry weight checks out at only 170 pounds more than that of a four-door sedan. The Conestoga does carry, however, these changes:

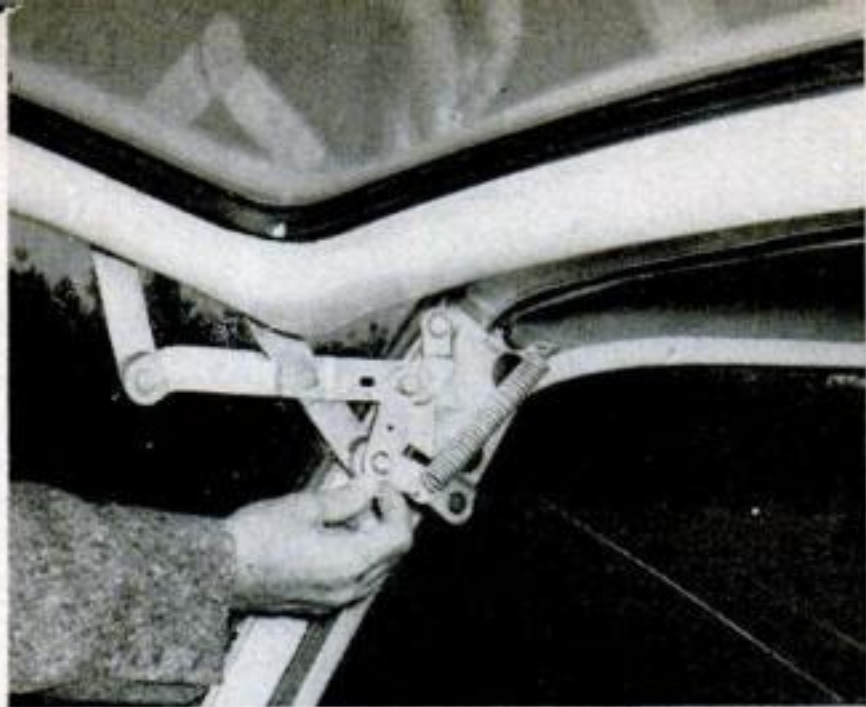
New rear springs. Standard rear springs, fitted to an experimental Connie, gave a fine ride at moderate loads. When Studebaker engineers piled in a severe overload—some owners will inevitably heave in a passel of cement bags—the Conestoga sat sadly down on its haunches. The answer to that was a special two-stage spring. It has two extra leaves arranged so that they don't come into play until the wagon is heavily loaded. With up to three people aboard,



VERTICAL FINS on grille are the best recognition feature for '54 jobs. The V-8 hood ornament was put on in mid-1953 after Mercedes squawked about earlier Y-shaped one.



FLOP THE REAR SEAT and there's 88½ inches of floor length with the tail gate down. Tailpipe dumps the exhaust in turbulent air behind wheel to lessen chance of any swirl-in.



SPRING partly counterbalances weight of rear window. If you want to drive with it up (in hot weather, a wagon is almost as breezy as a convertible), snap this link over a pin to lock it up. But don't forget to unsnap link before closing window or you'll bend bracket.

the new springs have the same rate as the old ones, and the same easy ride. But when you pile the pounds on the tail gate, she won't squat down like a depressed rabbit.

New shock valving. Having jiggered the springs this way, Studebaker changed the valving on the rear shocks so they'd have a matching damping characteristic. Connie rides well, without that trundling little jowl-shake some wagons have.

Axle and tire options. A Conestoga buyer will have a chance to tailor it to suit his country and his expected service. Depending on the engine he elects (six or V-8), on his transmission (automatic or manual with or without overdrive), and whether or not he lives in a hilly country or wants economy or performance, he may get one of a half-dozen

rear-axle ratios. These range from 3.54 to 4.88. If he expects to be lugging heavy loads, larger, extra-ply tires will be fitted.

Other '54 changes. Aside from Connie the rest of the line stays close to '53. There is a new front grille with vertical fins, and bumper guards have been redesigned to overcome an annoying tendency to underride and lock onto other cars. The armrest in the rear of the swanky hard-top coupe has been made removable—not that you can now seat a passenger in the middle, where his tail bone would still clunk inelastically on the drive-shaft tunnel—but a youngster can now stretch out across the rear seat.

Better brakes. The best mechanical news for 1954 is that they've beefed up the brakes. The previous ones got by, but they were hardly distinguished performers. The new ones are bigger, have self-centering brake-shoe pivots, and deliver far better stopping performance.

In the engine department, Studebaker's OHV V-8 has gone from 7.1 compression to 7.5, which was an option last year. This boosts output around two percent, to about 122 or 123 hp. Octane requirements increase slightly, though the engine is still contented with regular gas. (Studebaker doesn't plan to blow any bugles on this power rise.) Other changes under the hood are minor: new linkage to prevent throttle movement on hard turns or panic stops, and a bit more copper in the V-8 radiator.

FACTS ON '54 STUDEBAKER

Model: Commander Regal Station Wagon.

Engine: 90° V-8; 120 hp. at 4,000 r.p.m.; compression ratio, 7.5:1; piston displacement, 232.6 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,637; bore and stroke, 3 $\frac{3}{4}$ " by 3 $\frac{1}{4}$ "; torque, 190 lb.-ft. at 2,000 r.p.m.

Weight: 3,368 lb.; per hp. 28.07 lb.

Transmission: standard, manual shift (overdrive and automatic available); rear-axle ratio, 4.09 with standard transmission, 4.27 with overdrive, 3.54 with automatic.

Steering ratio: 33.8-24-33.8 (over-all); radius of turning circle, left, 19 $\frac{1}{4}$ '; right, 19 $\frac{1}{4}$ '.

Effective brake-lining area: 173.4 sq. in.

Springs: front, coil; rear, 6 semi-elliptic leaves, 2 $\frac{1}{2}$ " by 50".

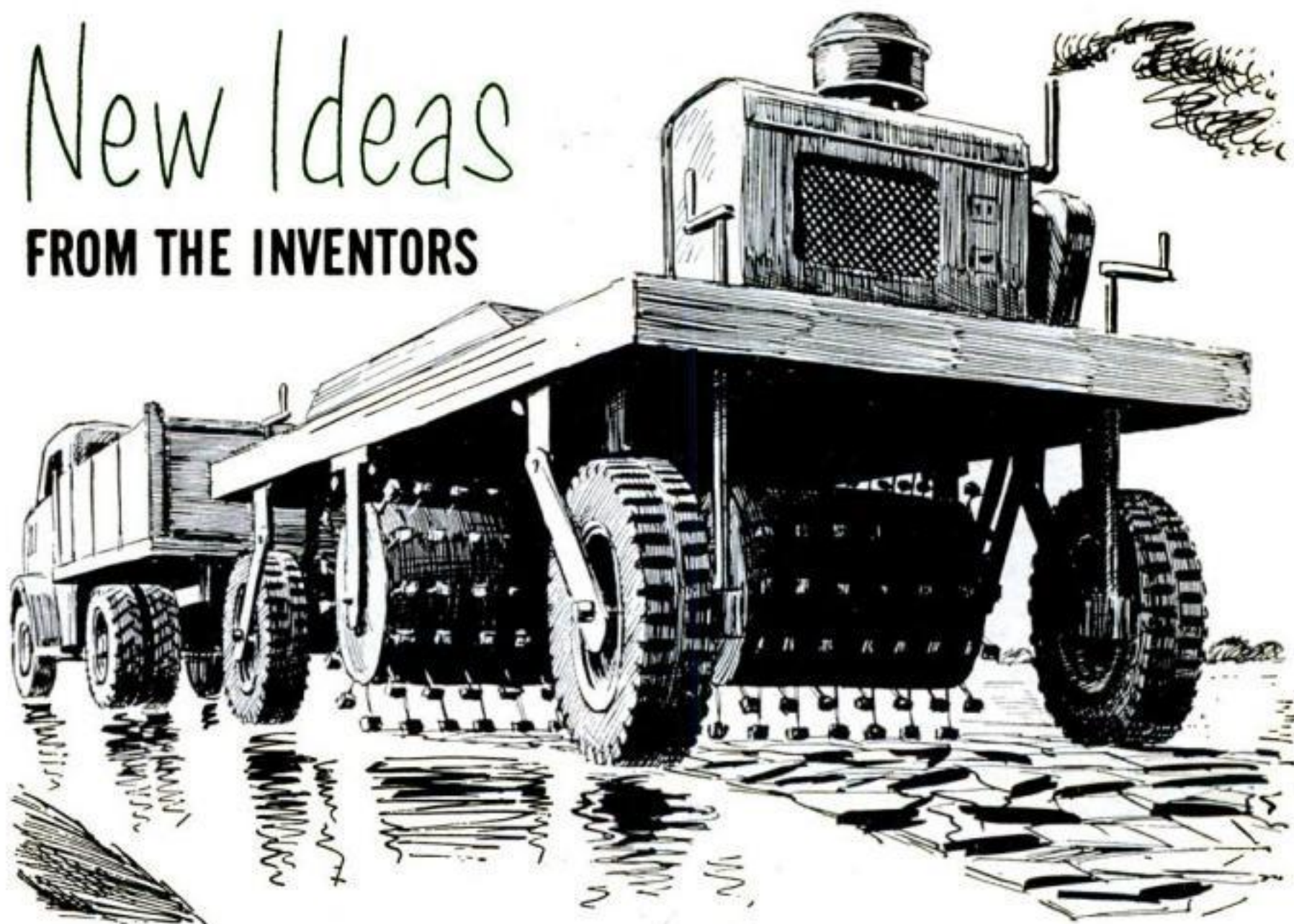
Outside dimensions: height, 62 $\frac{3}{4}$ " (loaded); over-all length with bumpers and guards, 195 19/32"; width, 69 $\frac{3}{4}$ "; wheel-base, 116 $\frac{1}{2}$ "; overhang, front 35 3/16", rear 43 15/16"; tread, front 56 $\frac{1}{2}$ ", rear 55 $\frac{1}{2}$ ".

Inside dimensions: seat-cushion width, front 59 $\frac{1}{2}$ ", rear 59"; leg room, front 42 $\frac{1}{2}$ ", rear 41 $\frac{1}{2}$ "; headroom, front 38", rear 36"; seat height, front 14 $\frac{1}{4}$ ", rear 14 $\frac{1}{2}$ "; vertical distance, steering wheel to seat cushion, with seat in rear position, 5 $\frac{1}{4}$ "; front-seat adjustment, horizontal 5 $\frac{1}{2}$ ", vertical 15/16".

Tire size: 7.10 by 15.

New Ideas

FROM THE INVENTORS



1 Beaters to Clear Road Ice. Hammer-ended chains attached to revolving drums on this proposed highway-maintenance machine would break up packed ice so it could be swept away by conventional road scrapers.

The mechanical chain gang would be towed by a truck or trailer but would carry an independent engine to turn the drums at fixed speed. Drums could be raised or lowered to suit road or ice conditions.



2 Window to Simplify Parking. Power steering now makes parking easier—but you still have to see where you're going. This window, set into the lower part of the door, would help by letting a driver see the far curb. In hot weather, the parking window could be opened to provide extra ventilation.

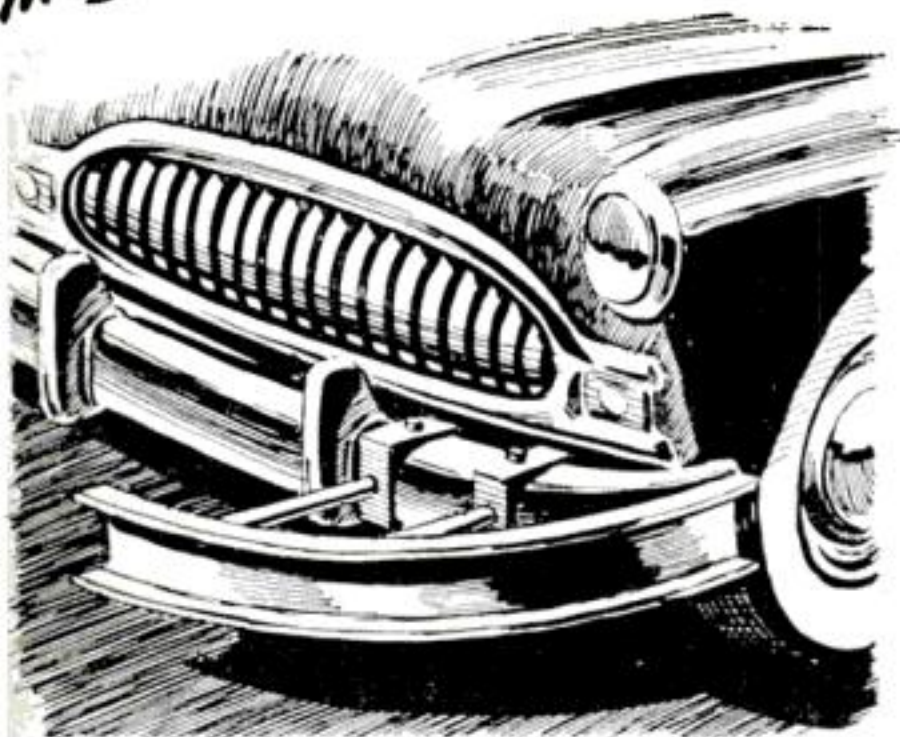


3 Hunter's Cap to Light Up. A sportsman who wore this blinker light on the top of his head could sink through the brush without danger of becoming a target for careless hunters who aim mainly by ear. The bulb, under a colored dome, is powered by a small battery carried in the wearer's jacket pocket.

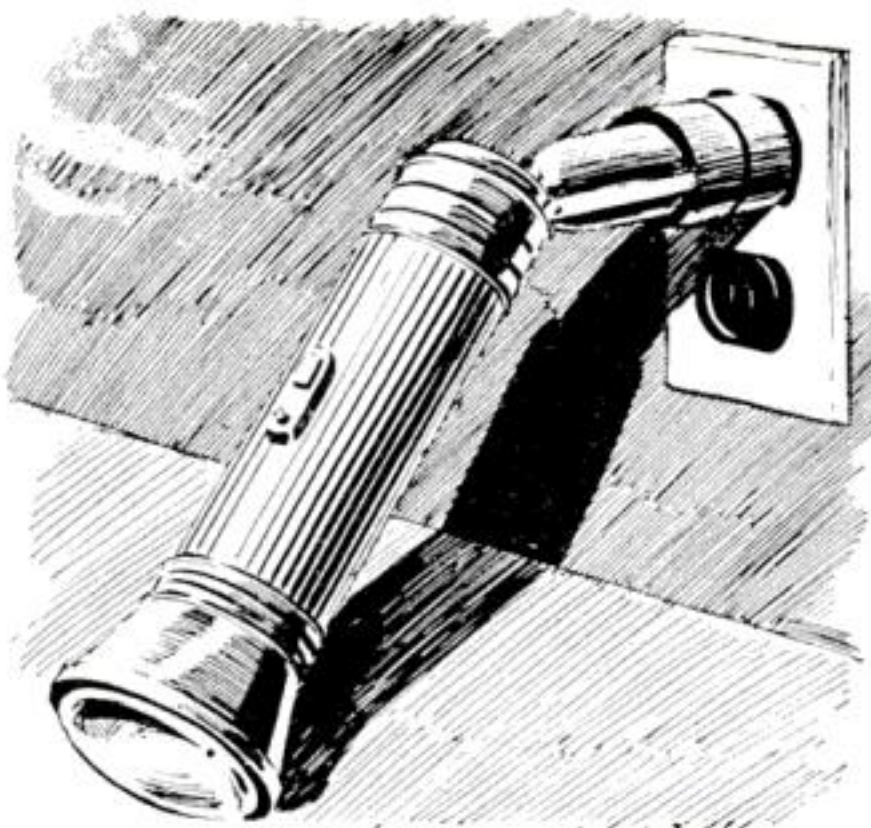
Please turn the page for more new ideas.

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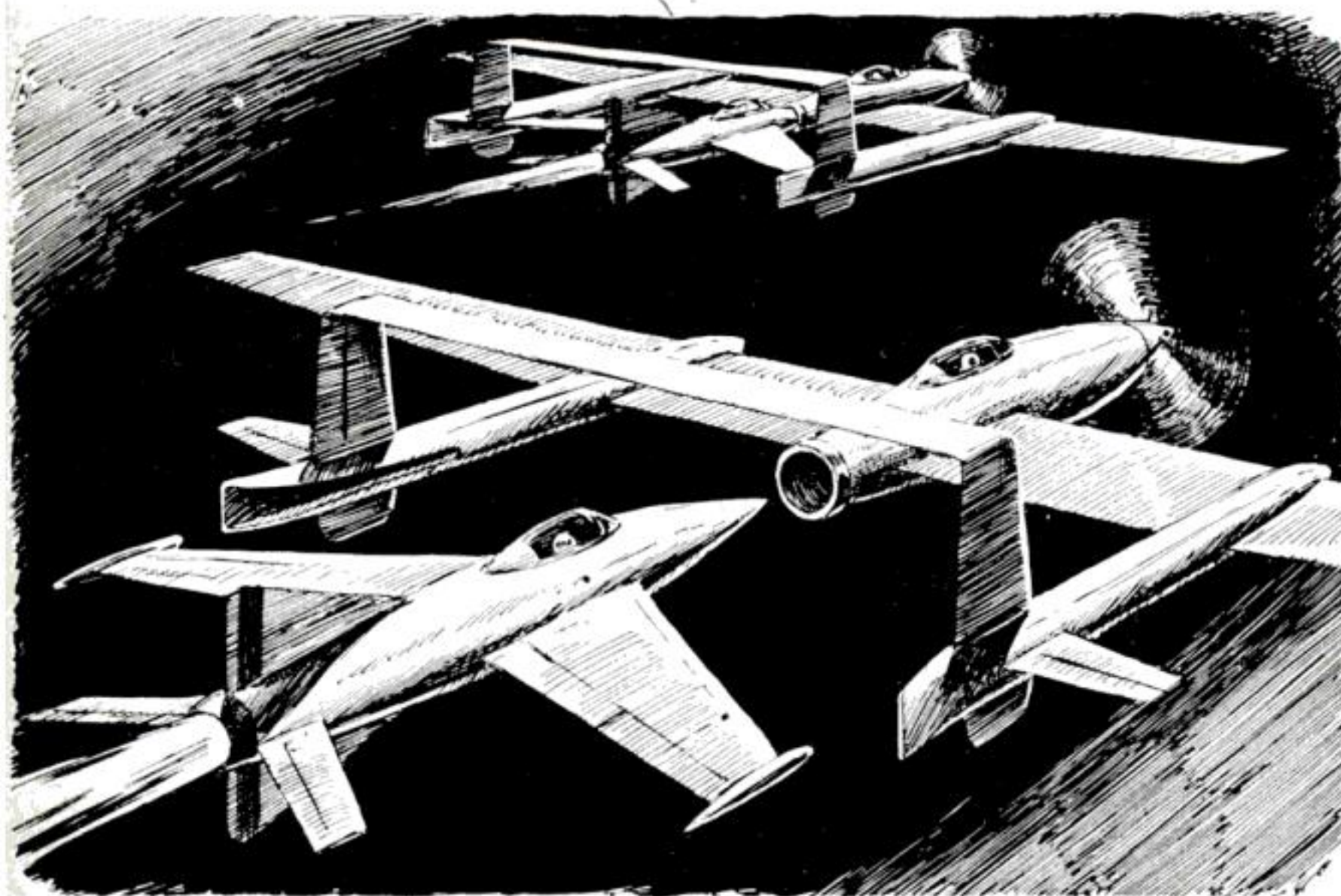
MORE New Ideas from the



4 Bumper Guard to Deflect Car. Side-swipes and even head-on collisions might do less damage if cars were equipped with these deflecting guards. The rigid channel, bent in a broad arc, would be bolted to either or both sides of a bumper. If the car rammed an obstacle, the guard would tend to shove the car sideways.



5 Flashlight to Be Recharged. A new set of flashlight batteries would be as near as a wall plug if your torch were powered by a wet cell and had a built-in charging unit. This standard-size flash would have a rechargeable battery and a rectifier assembly that would slide out of the case and plug into any AC or DC outlet.

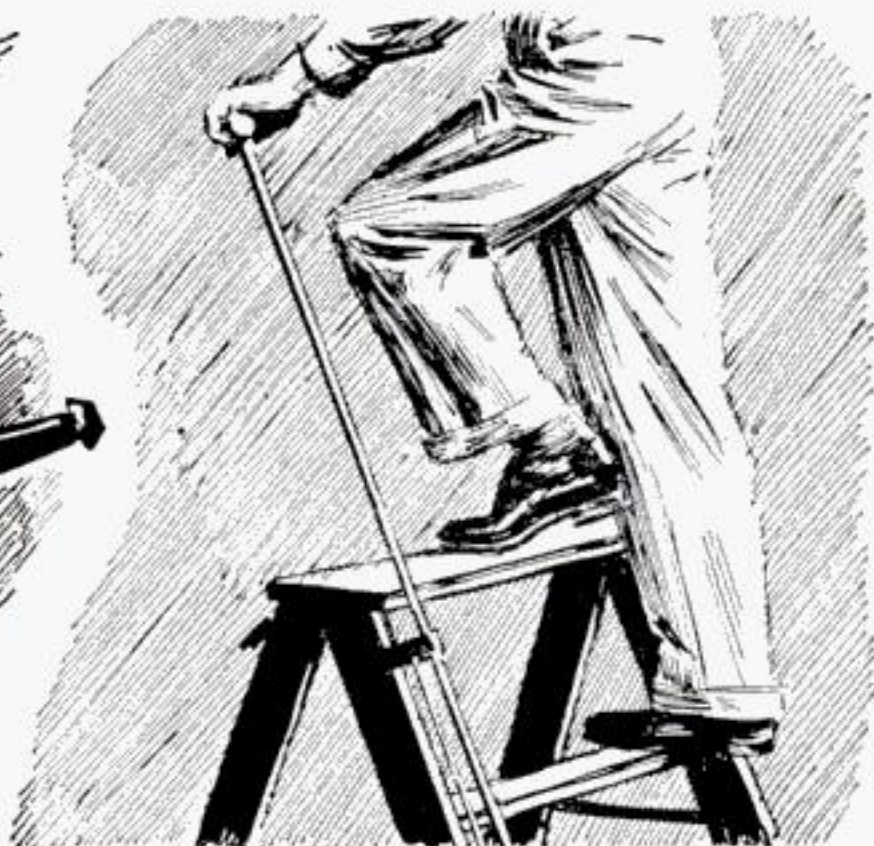


6 Fuselage to Form Second Plane. A plane intended for high-speed flight usually has to be carried aloft and launched at suitable speed. According to this French invention, the carrier and carried plane could form a single airborne unit. After the

composite plane passed the minimum flying speed of the high-speed subsection, the mother plane would accelerate to pull away from its passenger. The small unit could rejoin the carrier by flying in behind it and locking itself in position.



7 Liquid Filter to Cool Pipe. Before smoke from the bowl of this pipe reached the mouthpiece it would pass through a chamber partly filled with liquid. As the smoke whirled over its surface, the liquid would cool the smoke and, says inventor, absorb some of the tars. Valves would prevent liquid from leaking into bowl or stem.



8 Ladder Rail to Steady Climber. The feeling of unsteadiness that makes ladder climbing dangerous for many people might be overcome by a safety rail that would give a climber something to hold onto. This attachment would consist of a pair of mounting brackets and an extension rail that could be pulled out to any desired length.

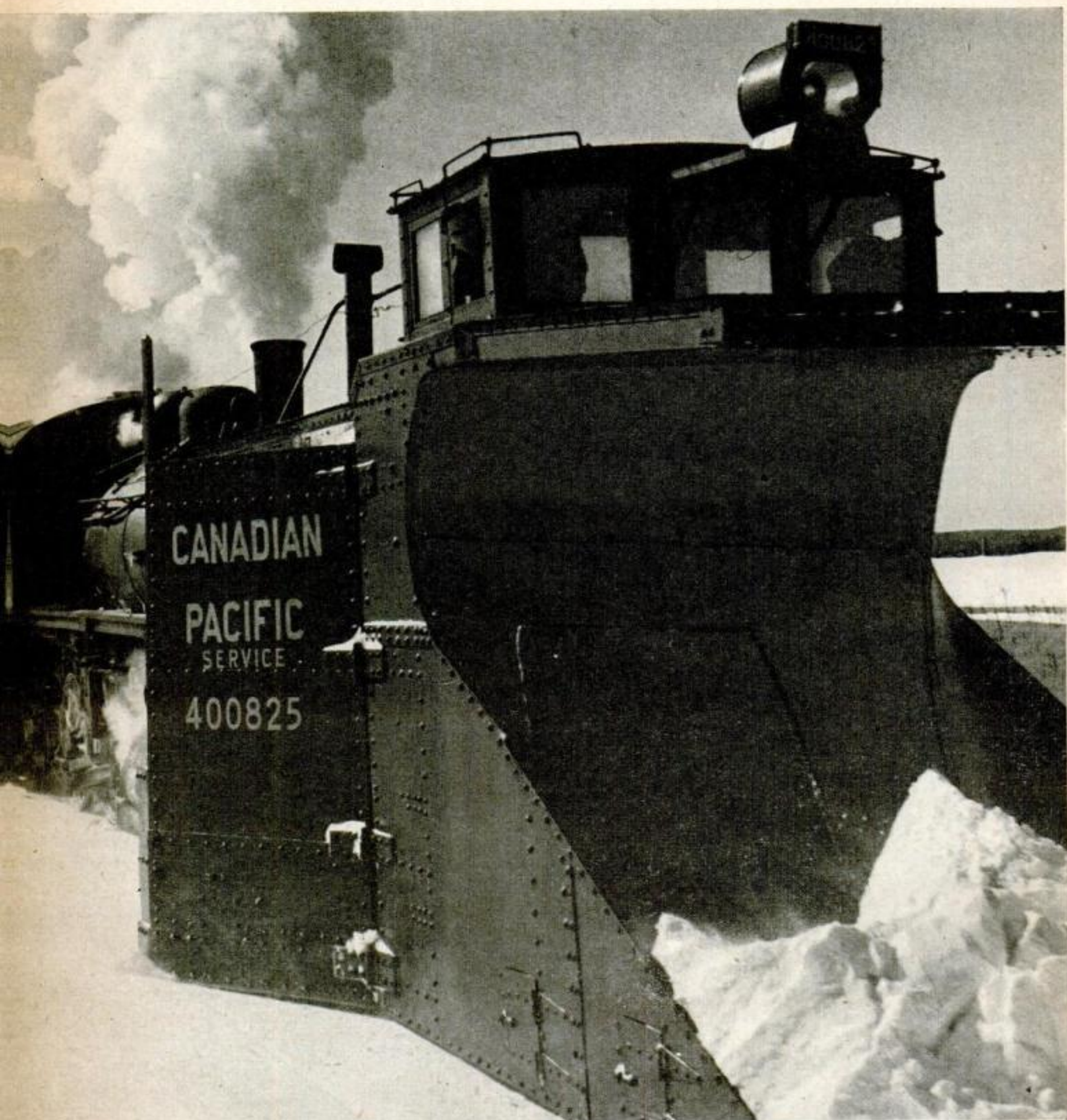


9 Billy to Fire Tear Gas. A policeman would always have a useful piece of equipment at hand if he carried this double-duty club. The body of the club would contain a hollow tube, the handle a firing mech-

anism for tear-gas cartridges. Pressing a plunger on the handle would launch the cartridge toward its target. A sliding cap would protect the plunger against accidental discharge.

U. S. patents on these inventions have been granted to: 1. W. A. Lommen, Windom, Minn.; 2. R. Schostal, NYC; 3. N. Prupis, Seattle; 4. M. M. Williams, Miami; 5. R. S. Coolidge, Center Sandwich, N. H., H. W. Keeley, NYC, R. S. Smith, Norwalk, Conn. and T. N. Anderson, Huntington Station, N. Y.; 6. R. A. Robert, Paris, France; 7. F. E. Null, Dayton, Ohio; 8. J. S. Tepper, Monrovia, Calif.; 9. E. C. Borders, Milledgeville, Ga.

*A*cross a vast land laden



*"...there to toss the blizzard from his path
Across the prairies of Saskatchewan."*

with snow... **Canada delivers the Christmas Mail**

By Wesley S. Griswold

GIVEN a frosty dominion 3,800 miles broad and 3,000 miles deep to crisscross on his appointed rounds, the Canadian postman at Christmas faces a task for which he must call upon nearly every type of vehicle devised by man.

This epic mobilization of transport, ranging from the simplest, almost ageless means to the most mechanistically modern, has inspired photographers of Canada's National Film Board, and we have here chosen fitting fragments from the verse of Canadian poets to caption their romantic pictures.

To the laboring postman's aid come planes on pontoons,

"Empty prairie slides away on all sides . . ."

—ANNE MARRIOTT



—E. J. PRATT



"There is virtue, too, in a grey and dragonish sea."—CHARLES BRUCE



*"Cold-blooded things yet not marine,
And not of earth, but half-between . . ."*—E. J. PRATT



*"Comes like a swallow
veering home."*



*"A common hope dilates each breast.
One spark gleams in each eye . . ."* —LEO KENNEDY



—DUNCAN C. SCOTT

wheels and skis. Trains of railroad cars and trains of sleds, drawn by tractors specially footed to tread snow "high to a horse's belly," help carry the burden of gifts and holiday messages across the white continent from Come By Chance, Newfoundland, to Spuzzum, B. C.

Yuletide mail is borne by ship and ice canoe, by snowmobile and handcart, by dog sled and by a solitary, ship-based helicopter, by pack horse, and by horses hauling buggies or sleighs—"slides," the Newfoundlanders call them.

It's a job of heroic proportions, enlisting more than 33,000 extra helpers for the 42,000 Canadians who regularly man the country's efficient postal service. It begins in late June, when the government ship *C. D. Howe* lifts anchor at Montreal and heads for Arctic waters still flecked with ice, carrying in its hold Christmas mail for the Eskimos and the many other Canadians who live and work in the remote Northeast. It picks up momentum just before Thanksgiving, when packages for relatives overseas funnel into eastern and western ports to be hoisted aboard ocean liners. It



*"Will they come again, the great spirits,
Bringing us gifts as they promised . . . ?"* —ARTHUR S. BOURINOT

reaches its sprawling, bustling climax early in December, when the flood tide of mail and postal clerks laps over into church halls, automobile salesrooms, schools and fraternal clubrooms.

It's an essential job that, as Archibald Lampman, a Canadian poet, has written, goes on "all day without stint and all night long with the sweep of the hissing drift."

END



*"And our hearts were great with happiness
And brothers we called them . . ."* —ARTHUR S. BOURINOT





Blanket Wraps Up Flame

A NEW blanket is made of glass—but it's to put fire under wraps, not you. Its glass fibers are coated with a plastic compound to give added strength, durability and resistance to weather. Standard Safety Equipment Co. of Chicago makes it.



Come on Up, Parking's Fine

THIS giant car lift lets two cars park where one parked before. Called a Sky Park, the machine was perfected by the Simmons Machine Tool Corp., Albany, N. Y. It is designed for use at parking lots or curbs.



Skates Roll or Slide

THE sole plates of this German boy's skates carry axles as well as blades. When there's no ice, he just adds wheels for sidewalk cruising. The "convertibles" were shown at a fair in Nuremberg.

Earphone Silences Television for All but One Listener

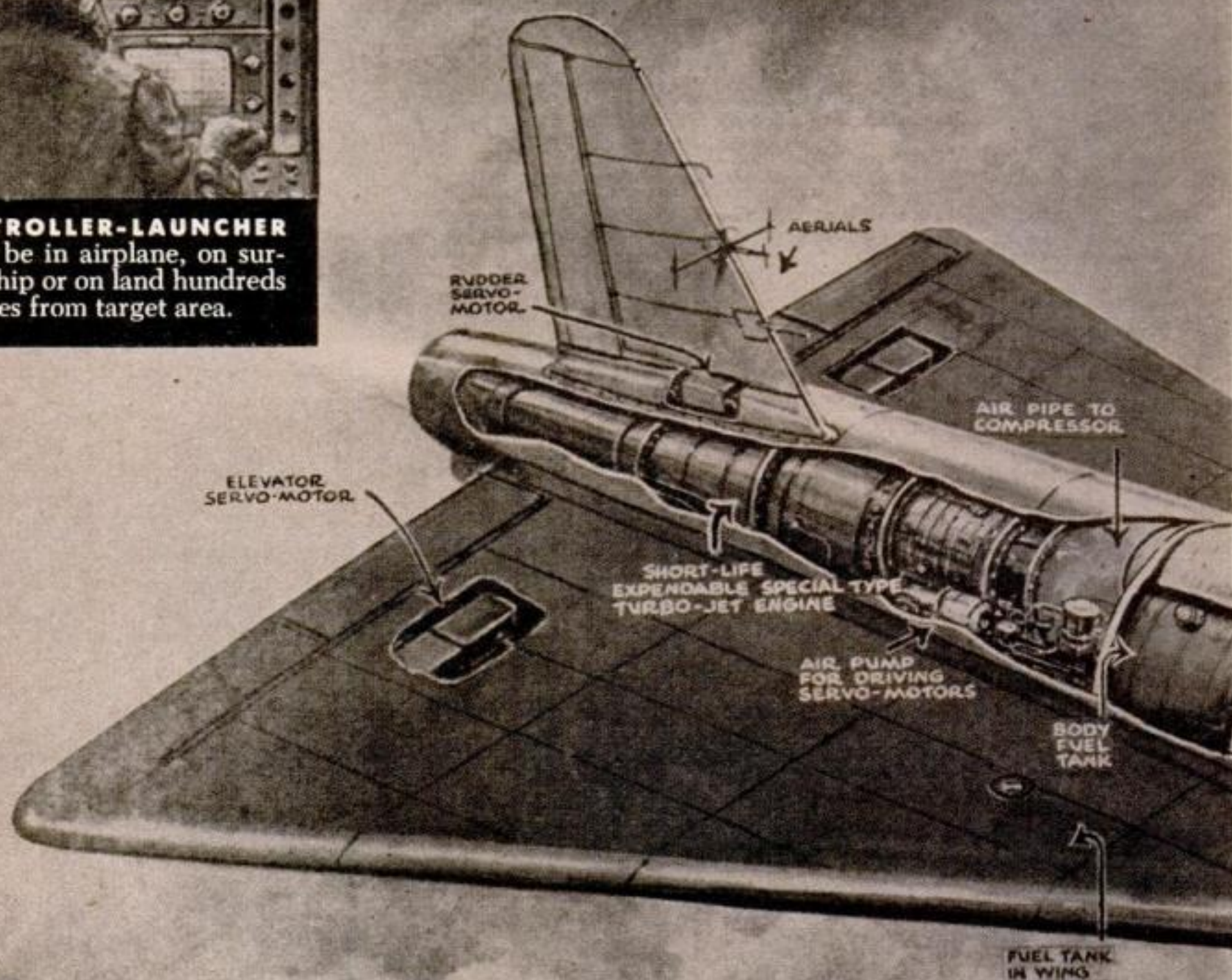
JUNIOR's TV programs get you down? You can read in peace in the same room if he has his own earphone which he wears like a hearing aid. A flick of the dial returns the sound to the regular loudspeaker. Kentrol Corp., Philadelphia, makes it.

▶▶▶A special cleaner for plastic dishes is now on the market. M-E will safely remove coffee, fruit and other hard-to-budge food stains, says Maid-Easy Cleansing Products Corp., Mount Vernon, N. Y.





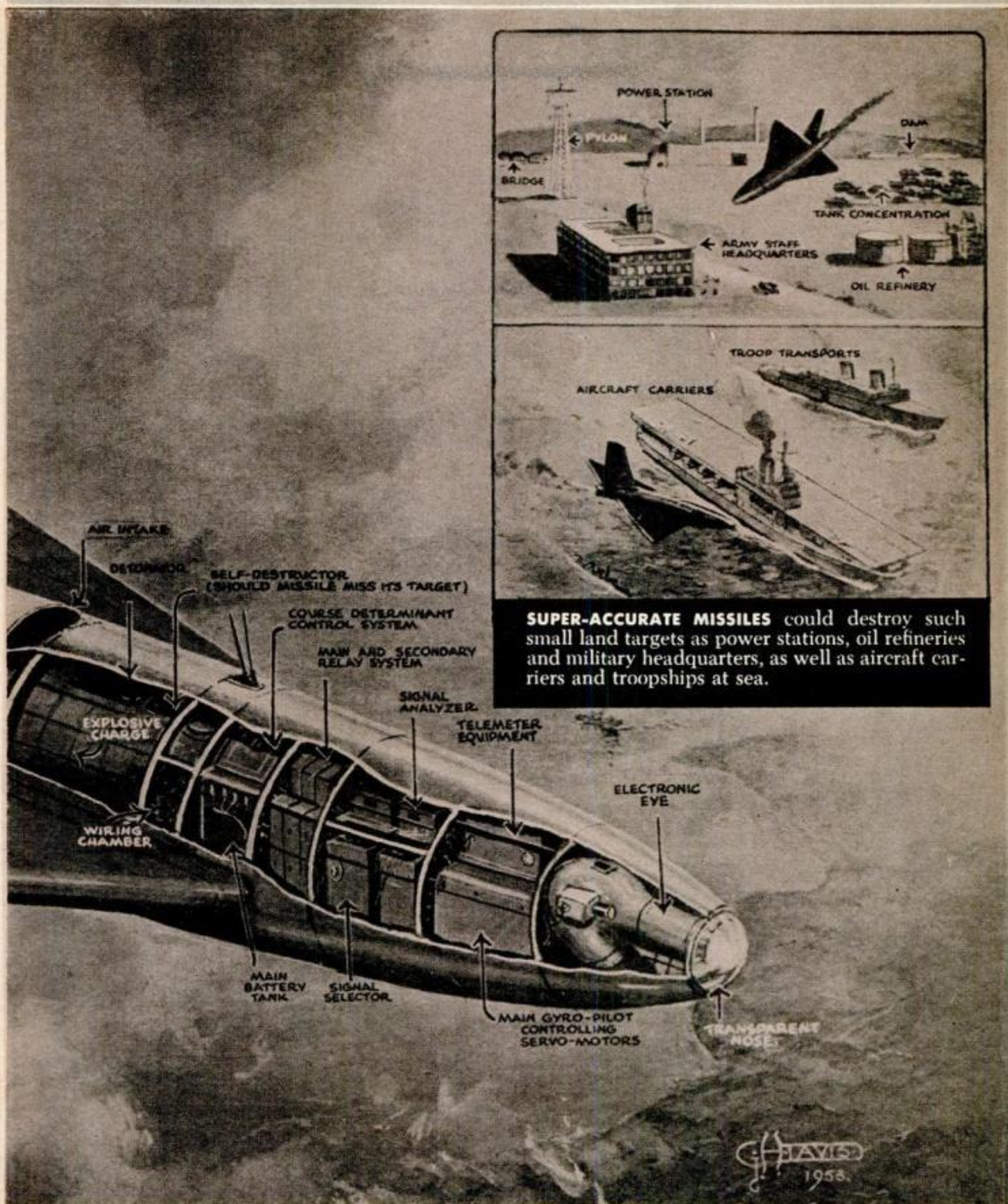
CONTROLLER-LAUNCHER could be in airplane, on surface ship or on land hundreds of miles from target area.



Seeing-Eye Jet Proposed as Robot Raider

LONG-RANGE missiles that can "see" and home on their targets are being designed by the British. The illustration above, from the *Illustrated London News*, is a conception by the artist G. H. Davis of how one of the weapons might look.

The nose is a radome that transmits

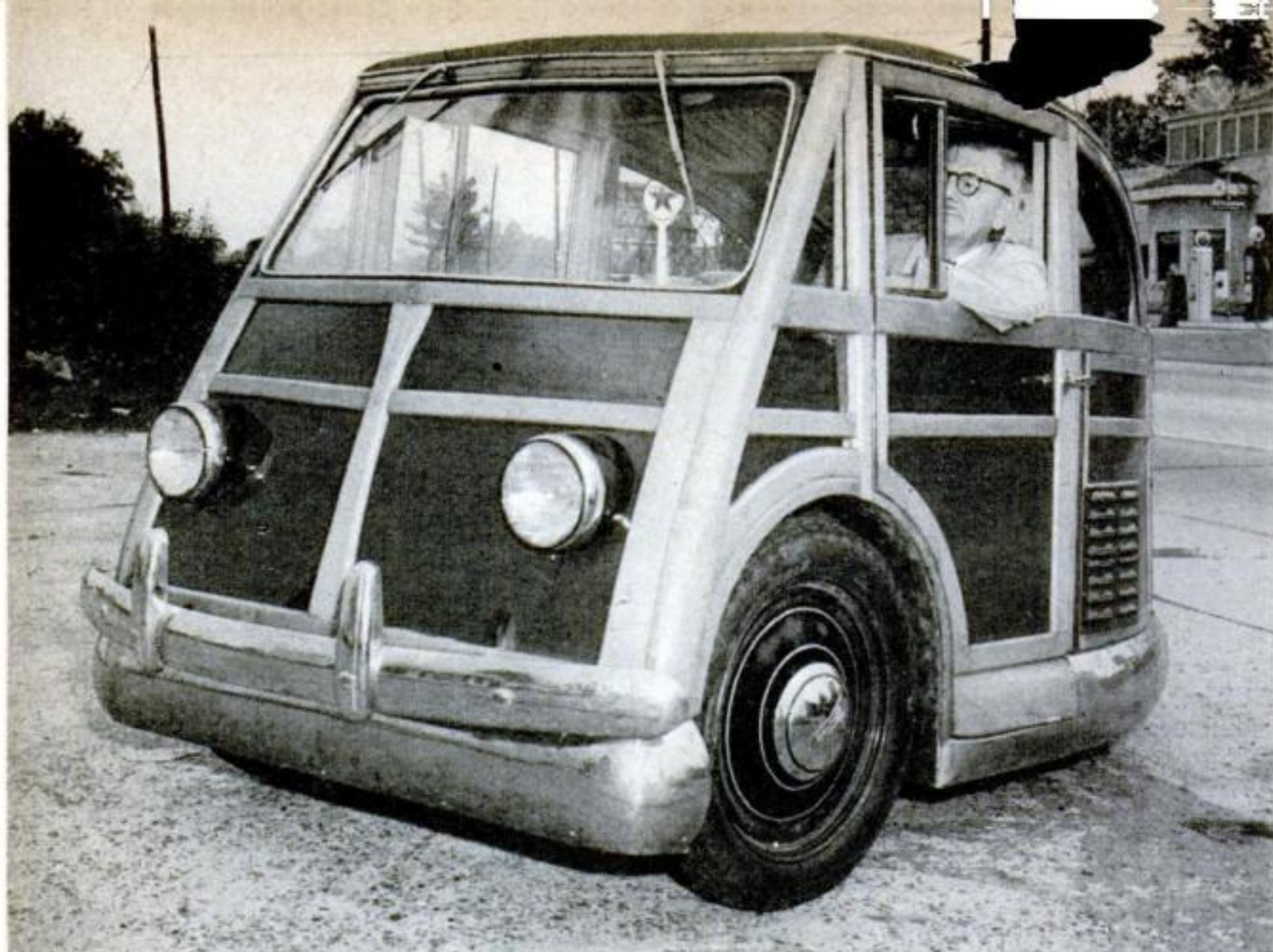


SUPER-ACCURATE MISSILES could destroy such small land targets as power stations, oil refineries and military headquarters, as well as aircraft carriers and troopships at sea.

what it "sees" to equipment that digests it and puts the missile on course. The only human hand involved in its flight is that of the controller who launches it. He can be hundreds of miles from the target.

The delta-wing missile pictured would

be propelled by an expendable jet engine—the same kind powering fighters and bombers. Its speed would be considerably short of 1,000 m.p.h.—far less than that of rocket-powered missiles. In case it got off course, it would be equipped to destroy itself in the air. END

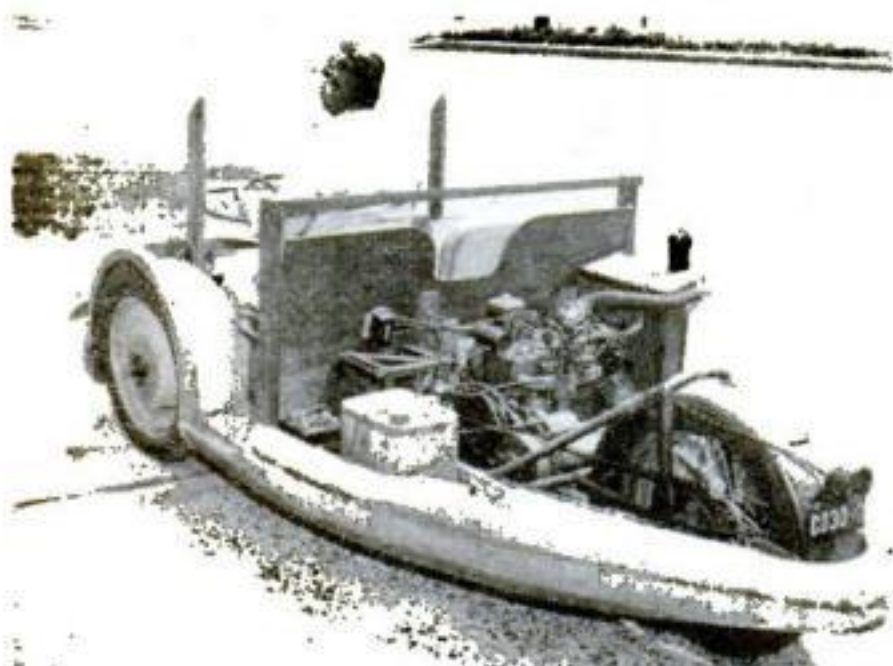


Station Wagon Runs on Three Wheels

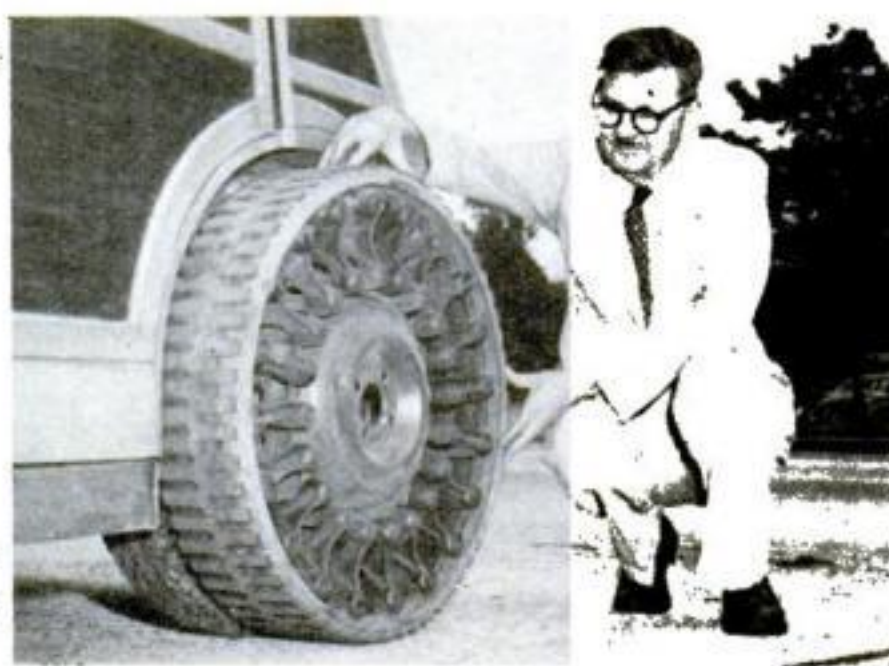
IF YOU want a really low-priced car, reasons James V. Martin, inventor of the small three-wheeler shown above, you have to eliminate a lot of the things that make a car expensive to produce, and still not sacrifice large-car roominess and high performance.

Here are some of the parts of a conventional car that are not found in this little vehicle: chassis frame, axles, steel springs, propeller shaft, universal joints, differential gears, shock absorbers.

The Martin Stationette is being engineered for production by the Commonwealth Research Corp., New York City, to sell for around \$750. It has 49 inches headroom, the seat is the full width of a normal car and there is a 43-cubic-foot storage space over the rear engine. The car is 114 inches long and has a 52-inch tread. Airplane-type suspension, a rubber shock cord, takes the place of springs on the prototype. An unusual wheel to replace all springing is planned for the production model.



FOUR-CYLINDER, 24-horsepower, water-cooled engine is rear-mounted. A cruising speed of 50-55 miles an hour is claimed.



NEW TYPE OF WHEEL, invented by Martin, has solid-rubber rim and flexible-rubber spokes, is claimed to provide all springing needed.

Games Disclose Secrets of Success

Scientists are determining the best strategy in war and business by watching their students play cards.

By Bruce Bliven

IF YOU were a college student and were told by your instructor to play poker in the classroom, you might think he was out of his head. But he might know exactly what he was doing.

In half a dozen American colleges, hundreds of students have been playing specially modified forms of card games in the interest of scientific knowledge. Such experiments already have had important results and are likely to have more.

These games are played under conditions that would bewilder and annoy the boys in the back room of Joe's Smoke Shop. Special rules are written, and these sometimes are changed without warning. At stated intervals, too, play is halted and observers standing behind the players take elaborate notes.

Consider, for example, the way students of Prof. Lyle Shannon at the University of Washington play the card game called "Monopoly." This is a game in which players are dealt cards representing various quantities of "money," with which they "buy or sell real estate." The object is to obtain ownership of as much "property" as possible. When Monopoly is used for scientific experimentation, the cards are dealt purposely to make some players "rich," some "moderately well-to-do," and others "poor."

Then, while the play is progressing, dice are thrown, and

The mathematical odds against a perfect bridge hand, if the cards have been properly shuffled, are

635,013,559,599 to 1

Strategy Helps in Finger Game



In this game, two players simultaneously show one, two or three fingers; and one of them tries to call out the total number of fingers shown by both. Thus it involves both luck and skill in outguessing the other fellow. On

the basis of complicated mathematics, Dr. John Von Neumann has worked out the best strategy: Keep guessing that the combined number of fingers shown is four: in every 12 games, show one finger five times, two fingers four times, three fingers three times—but not in any regular order. You

should at least break even, probably win. What happens if you and your opponent both follow this strategy. Von Neumann doesn't say!



according to how they lie, one or another of the players is notified that he has "inherited a fortune," or "suffered a disastrous fire" or "experienced a lingering illness." His cards are then changed to accord with these strokes of good or bad luck.

Hundreds of games, played this way over a period of years, have been analyzed to see what lessons in human behavior can be drawn from them. While these conclusions are thus far only tentative, some have turned up with such regularity that they can be put forward with confidence. A few are:

In the playing of these games, the rich tend to get richer, and the poor get poorer. The resources of the well-to-do give them an advantage *which is not overcome by superior skill* on the part of the poor.

The poor are inclined to gamble recklessly and extravagantly, and for this reason to lose everything they have. The well-to-do, the only ones who can really afford to gamble, take smaller chances. But even if they lose, it isn't fatal.

While training, experience and education are useful to everybody, they are more useful to the rich than the poor.

The results of these experiments interlock with those achieved in an exciting new aspect of science called "the theory of games." The known principles of probability have been applied to games which employ a combination of luck and skill, in ways that involve tremendously complicated mathematical formulas. And human behavior in games of the type mentioned, which involve some skill and some luck, has been found to be identical with what people do in competitive business and with strategy and tactics in war.

Flouting Math-Proved Principles Can Be Ruinous

In all these activities, there are good and bad broad, general courses of conduct, which can be mathematically proved to be such.

Some of these principles, of course, have in the past been practiced intuitively by shrewd individuals, whether they were playing cards, running a business or fighting a war. Now for the first time their shrewdness can be underpinned with scientific facts. Learning these principles might not make you a good poker player or a successful general, but flouting them is fairly sure to be ruinous.

Examples of the contests that reveal these principles are nearly all card games; excluded are games of pure chance like throwing dice or betting on a roulette wheel. Excluded also are games like chess, checkers and ticktacktoe where no element of luck enters in, and each player knows at every moment the situation confronted by himself and his opponent.

Prof. R. Creighton Buck of the University of Wisconsin, one of the leaders in this new activity, emphasizes the underlying principle when he defines a game as "any situation involving groups with conflicting interests, in which the outcome is only partly controlled by each party." And Dr. Oskar Morgenstern of Princeton, another leading authority, highlights the point by observing that we habitually apply the language of games to such things as business and politics, speaking of "a political deal," or of "playing the stock market."

Some Formulas Can Be Applied to All Types of Chance

"When they are examined by the methods of modern mathematics," says Dr. Morgenstern, "it becomes evident that many of the forms of economic and social behavior are strictly identical with—not merely analogous to—games of strategy."

The most remarkable part of the matter is the discovery that mathematical formulas often can be written which cover the best procedure in games, business and war alike. The United States Army, Navy and Air Force are today spending millions of dollars annually studying the relationship of games to war, and are deducing principles which will be of great importance in the future.

Several centuries ago, it was learned that there are mathematical laws of probability which apply to matters where there is a strong element of pure chance. The first scientist to go deeply into the question was the famous German philosopher and mathematician, Gottfried Wilhelm Leibnitz (1646-1716). Coming down to modern times, the person who best deserves to be called the father of the new science is Dr. John Von Neumann of the Institute for Advanced Study, the internationally famous intellectual center at Princeton, N. J.

Dr. Von Neumann, now 50 years old, was born in Budapest, Hungary, and studied mathematics at various European universities. When it became clear that Hitler was going to dominate Central Europe, he came to America and became a professor at Princeton University. Experts regard him as one of the greatest mathematical brains in the world. For many years he has performed valuable services in help-

Strategy Doesn't Help in Roulette

Here the result depends on pure chance, and mathematicians say no "system" is safe. One of the commonest systems is to select one color—red or black—and keep betting on it. If you lose, double your bet next time and so on. Thus one winning bet will slightly more than compensate for all previous losses. But this system assumes that red is sure to turn up after black has won a few times in succession, and vice versa. Actually, after black has won 10 times in a row, the chance that it will come up again is still exactly 50-50. If you started by betting \$2 on red, on the eleventh try, after losing \$2,046, you are simply betting \$2,048 on an even chance.



ing the American armed forces in the development of new weapons.

A few years ago, in collaboration with Dr. Morgenstern, he wrote a book, *The Theory of Games and Economic Behavior*. Although every page is sprinkled with difficult mathematical formulas, so that the volume is hopelessly beyond the understanding of the average layman, it has gone through edition after edition as mathematicians, sociologists and military strategists have pondered its revolutionary proof that in games and other activities which involve some skill and some pure luck or chance, *there is always one best strategy*.

Business competition is like a card game. You know the strength and weakness of your own position but you can only guess at those of the other fellow.

This is also true of war. The commander of an army knows what forces are at his disposal, and the general character of the terrain over which he must fight. Usually he knows something about the size of the enemy army, but not very accurately, and he can only guess at what that enemy is about to do. The combination of his skill in maneuvering his own troops, his accuracy in guessing

what the enemy will do, and of course the relative size and strength of the forces on each side, will determine the outcome.

Using modern electronic computing machines, thousands of hours have been spent in doing the complicated mathematical calculations that are needed to discover the best strategy in various games which use both skill and luck. As an example of the complications that exist, Dr. Von Neumann worked out the simplest possible two-handed game of poker. In this there are only two players, only three cards in the deck, and only three bids, two of them by the dealer. Even so, there are 1,728 possible combinations of play. To figure out approximately the best strategy for each player would require two billion multiplications and additions.

It Pays to Know the Laws

Thousands of people lose large sums of money every year in gambling because of a misunderstanding of the laws of probability. They try to play a "system" in such games as tossing a coin or in roulette. Despite all the stories you

[\[Continued on page 246\]](#)

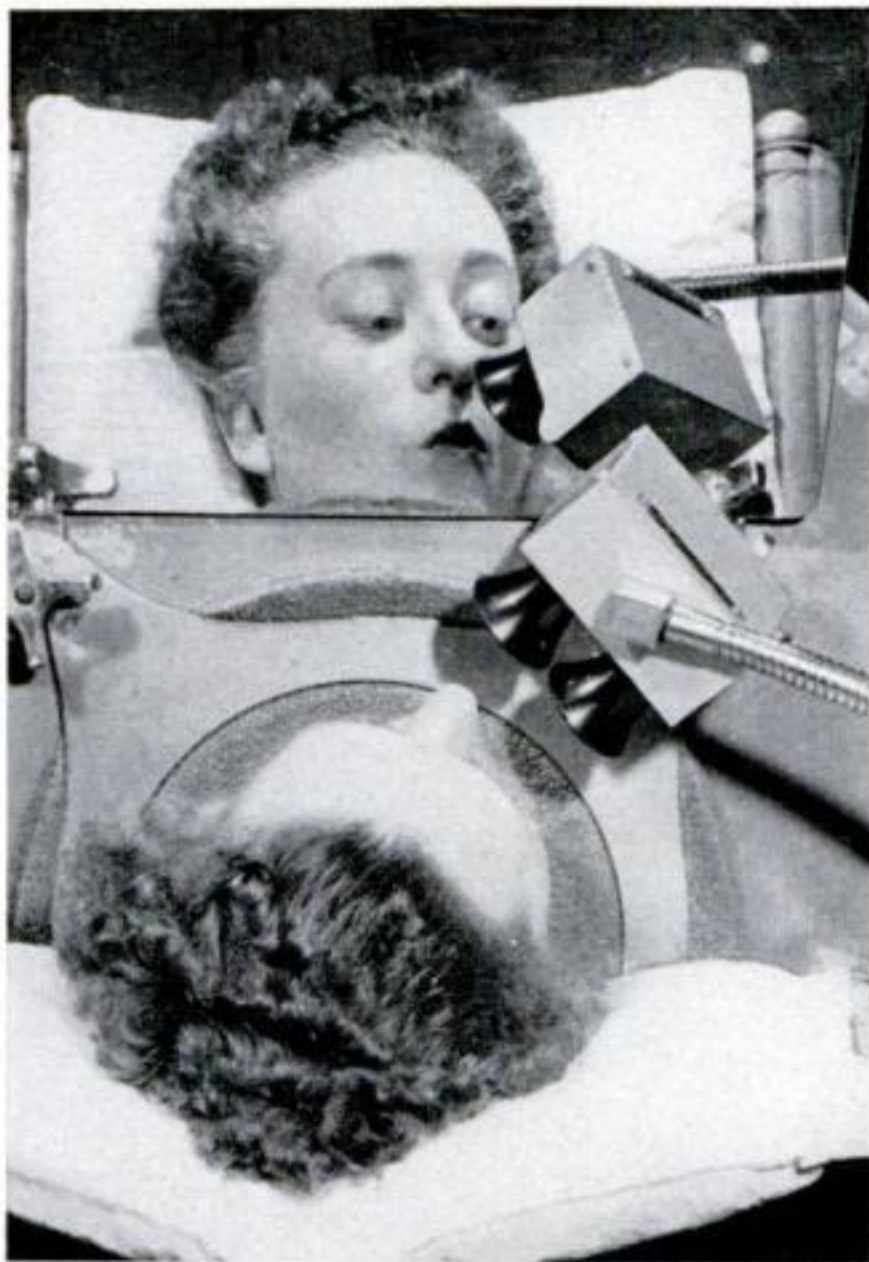
New Games Test Luck at Piloting Spaceships, Assembling Cars



BLAST OFF is based on the current interest in space travel. Players pilot tiny rocket ships through the heavens. They land on moving planets—Jupiter, Venus, Mercury, Mars, Saturn—pick up cargoes of rare minerals and try to be first to return to earth. Flights are determined by spinning a pointer, and victory depends mostly on luck.



ASSEMBLY LINE gives each player an automobile factory to manage. According to his luck in throwing a die and spinning a pointer, he puts together plastic auto parts—motors, bodies, wheels, steering posts—and rolls completed cars off the assembly line. Highest producer wins. Both games are made by Selchow & Righter, New York.



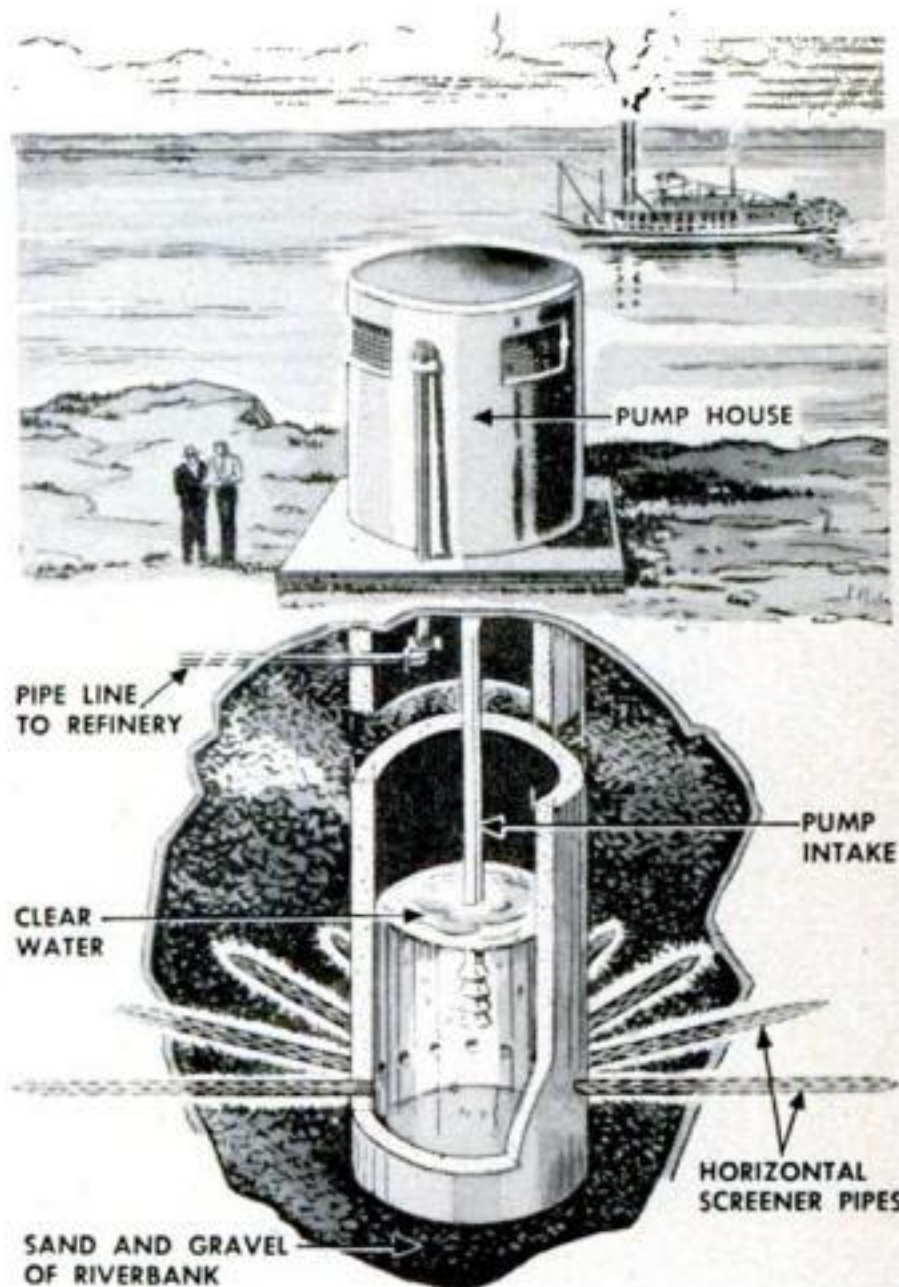
Breath Operates TV Set

A CONTROL switch so delicate that a breath of air can change it permits handicapped persons to operate a remote-control TV set. Blowing lightly through one of the mouthpieces shown above switches the loudspeaker on or off. Blowing through the other shifts the set from one channel to the next. The secret is a delicately balanced vane inside each mouthpiece. Moved by a breath, the vanes actuate cam-operated switches controlling relays. These in turn operate the control mechanisms. The device, shown being used by a polio patient in her home, was developed by the Lion Manufacturing Co. of Chicago.

207-Ton Casting for 50,000-Ton

RIDING the rails at right is the heaviest single object ever imported through the port of New York and the biggest casting ever made in the British Isles. It is part of a 50,000-ton-capacity hydraulic press that will forge air frames for the Air Force.

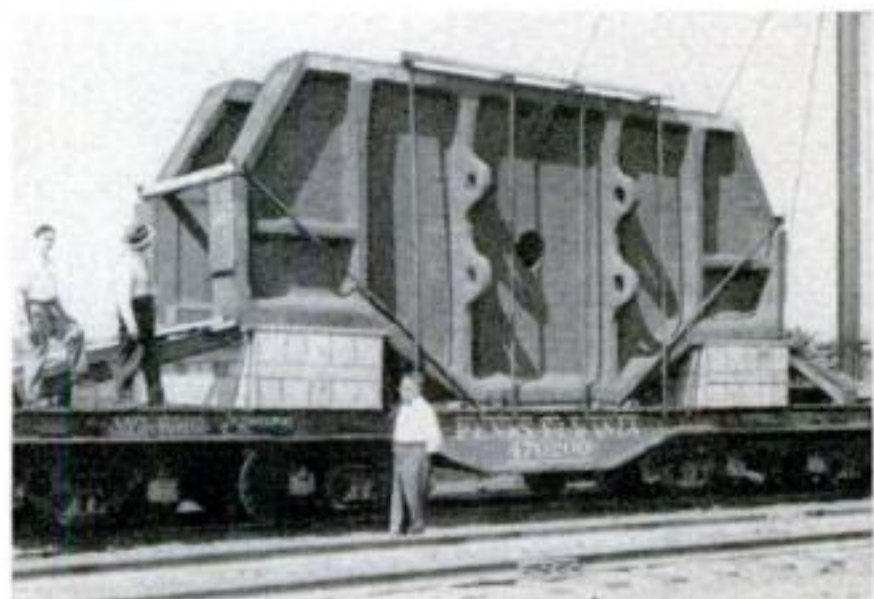
▶▶▶ Another smidgen of matter in the atom has been made in the Brookhaven cosmotron. Called the neutral V particle because of the shape of its vapor trail, it's similar to particles found in cosmic rays.

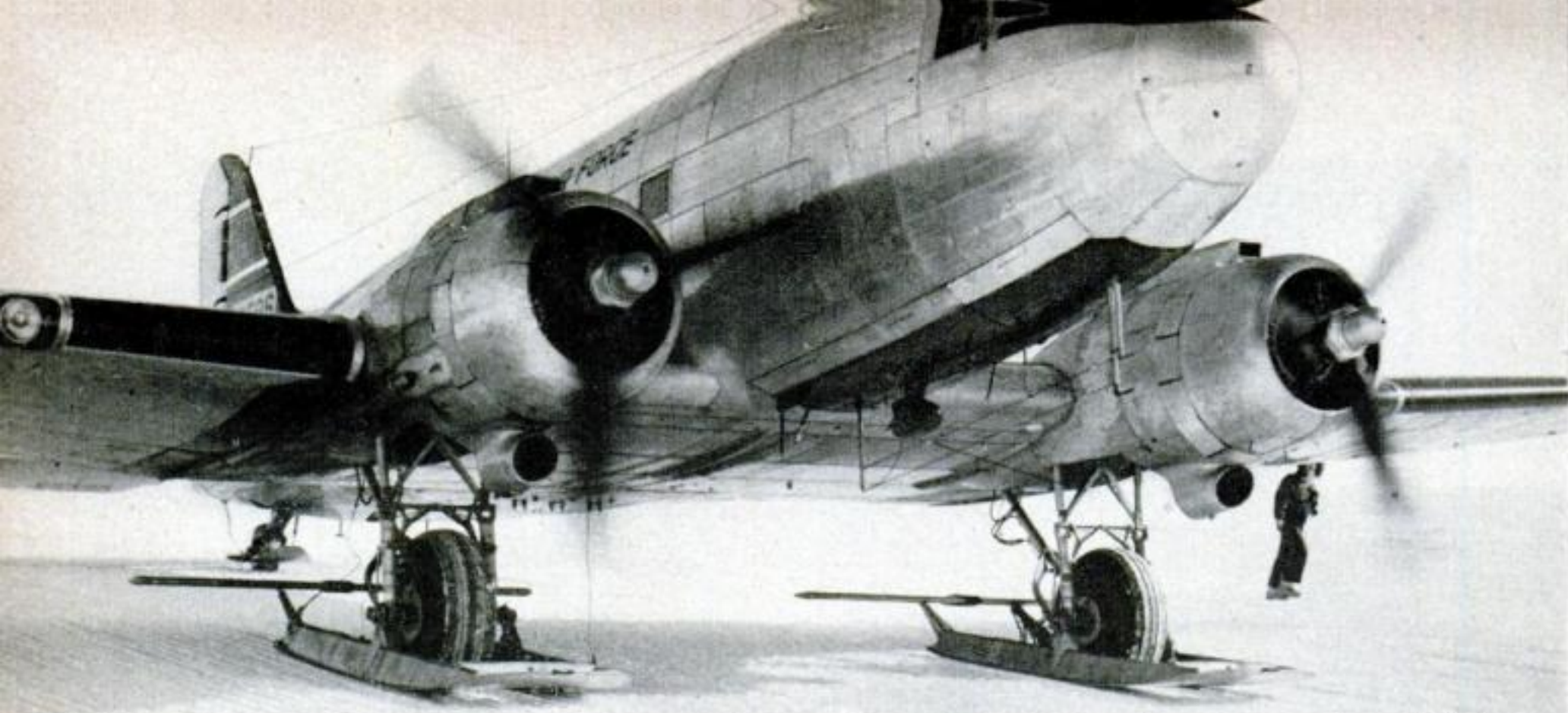


Well Filters Out River Mud

PROBLEM: how to tap the Mississippi without getting Mississippi mud. Engineers who needed new water sources for a refinery solved it by the horizontal well system shown in the drawing. The big 13-foot central shaft was sunk 112 feet deep near the bank of the river at Hartford, Ill. Then smaller perforated pipes, 104 to 176 feet long, were pushed out horizontally from the shaft into sand and gravel beds that underlie the Mississippi. Filtered through these beds, the water is perfectly clear by the time it reaches the collecting pipes. The well will supply Shell Oil up to 10,000,000 gallons of water a day.

Press Rides 16-Wheel Flatcar





USING SKIS OR WHEELS of their dual-purpose landing gear, as the snow condition per-

mitted, Air Force C-47s airlifted Seabees to the site, tested the airstrip as it took shape.

Airstrip Made of Snow Helps Guard Far North



A HARROWING JOB was the first step in building the snow airstrip. Tractors with broad, wood-slatted treads hauled special disk harrows on runners, like this one, across the trackless icecap. Chewing up the virgin snow made it denser and even in texture. It was then compacted by huge rollers, shown on opposite page.

Often a train of two tractors, a pulverizer and a roller combined the operations.

ON AN icecap near the North Pole, in Danish territory, the U. S. Navy and Air Force this year built a firm airstrip entirely of snow. In fact, the mile-long runway, 150 feet wide, was simply a compacted layer on top of several hundred feet of snow.

It was the first snow runway to be built so far north. The special equipment used, shown here at the job, was disassembled and airlifted to the location, along with the Seabees who put it together and set it to work.

Building the airstrip successfully out of material so abundantly at hand was a heartening demonstration to the men who are constructing a network of powerful bases in Arctic regions to protect the air approaches to northeastern Canada and the U. S.

Snow Is Pulverized, Then Packed Down

The technique was simple. It consisted of pulverizing virgin snow and then packing it hard with huge rollers. The surface became harder as it settled. Scraping and rerolling kept it in usable shape.

The equipment had been thoroughly pre-tested at Camp Hale, Colo.; in the Sierras; in Alaska; and at Kapuskasing, Ont.



TEN-FOOT, 11-TON ROLLERS of steel packed the pulverized snow. Most had a corrugated surface (above). Rear blades, seen on uncorrugated roller below, prevented caking.



Planes on skis made the first landings and take-offs, but by early June the airstrip was strong enough to be safe for wheeled aircraft.



TESTING SNOW DENSITY before the pulverizers go to work, this man is weighing a measured depth of snow. He got it with sampler (near right hand), melted it for water equivalent.



C-47'S WHEEL TRACK has gouged corrugated snow surface that easily supports two men who are measuring the track's depth. They will figure what weight the surface can bear.



Copter Plays Cops and Robbers

DOWN the highways and byways of rural England, a speeding car twisted and turned. But the driver never shook off the ominous roar that pursued him—the roar of a helicopter that clung grimly to his tail. Suddenly police cars loomed ahead at a crossroads, blocking him off. The fugitive car ground to a halt, trapped—just 14 minutes after the copter had sighted it from the air.

British police officials were playing cops and robbers to show student bobbies how

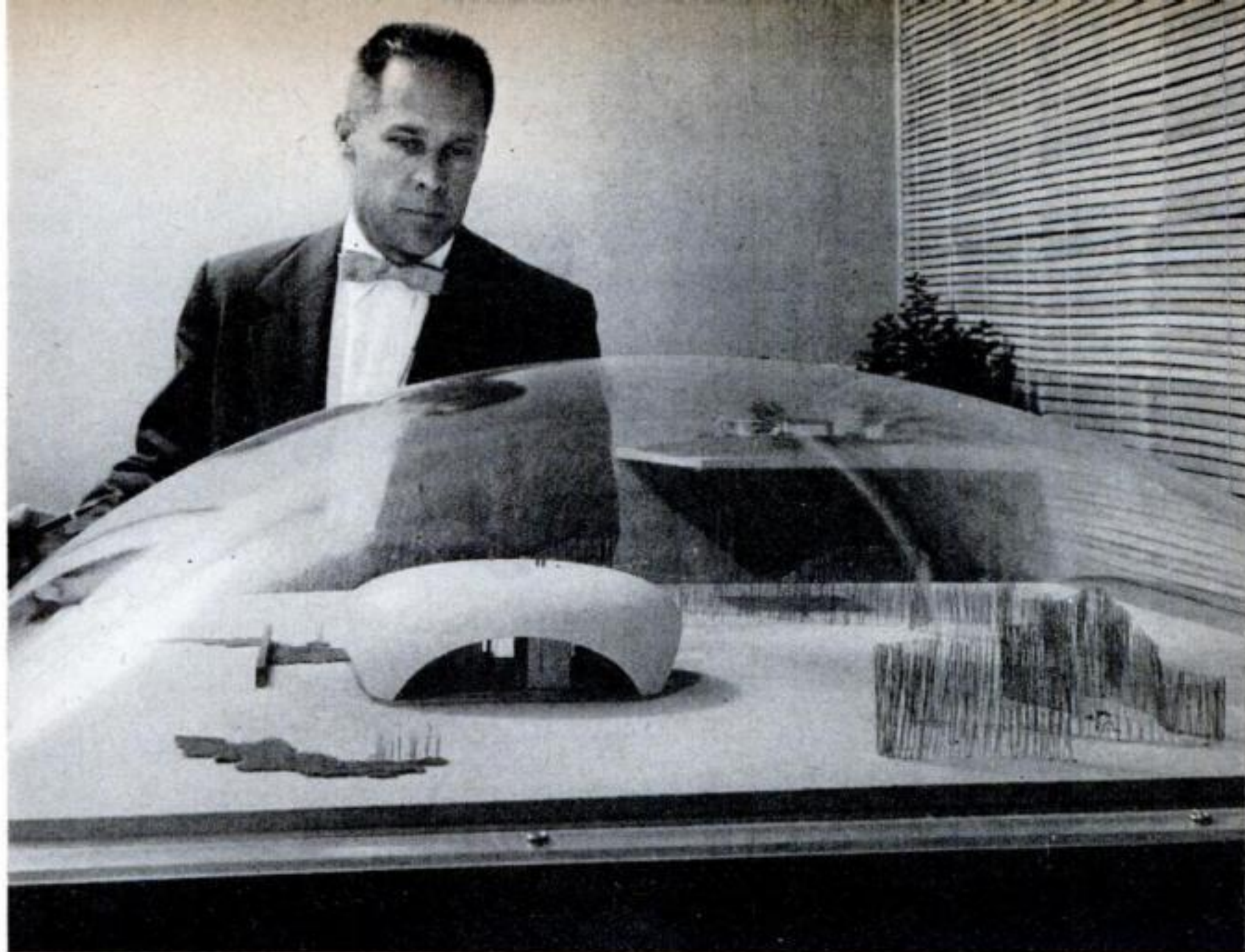
the helicopter could be used to capture escaping criminals. The “wanted” car with the fleeing hold-up men was given a head start, then a description was radioed to the pilot of a Bristol Sycamore copter. The pilot had no idea where the wanted car would go, but he quickly spotted it from the air. As he followed it at 150-foot altitude, he kept in constant radio touch with ground police in squad cars who headed off the fugitives.



HEADQUARTERS gets pilot's reports on fleeing car, relays them to squad cars in area.



PILOT'S-EYE VIEW as squad cars bottle up wanted car, coppers move in to nab “thieves.”



As designed by Eliot Noyes (above), bubble house has traded igloo look for graceful lines.



Life in a Bubble Can Be Beautiful

A modern architect proposes a new kind of living space in easy-to-build homes of gracefully arched design.

WHAT will it be like to dwell in a bubble house—a new design for living?

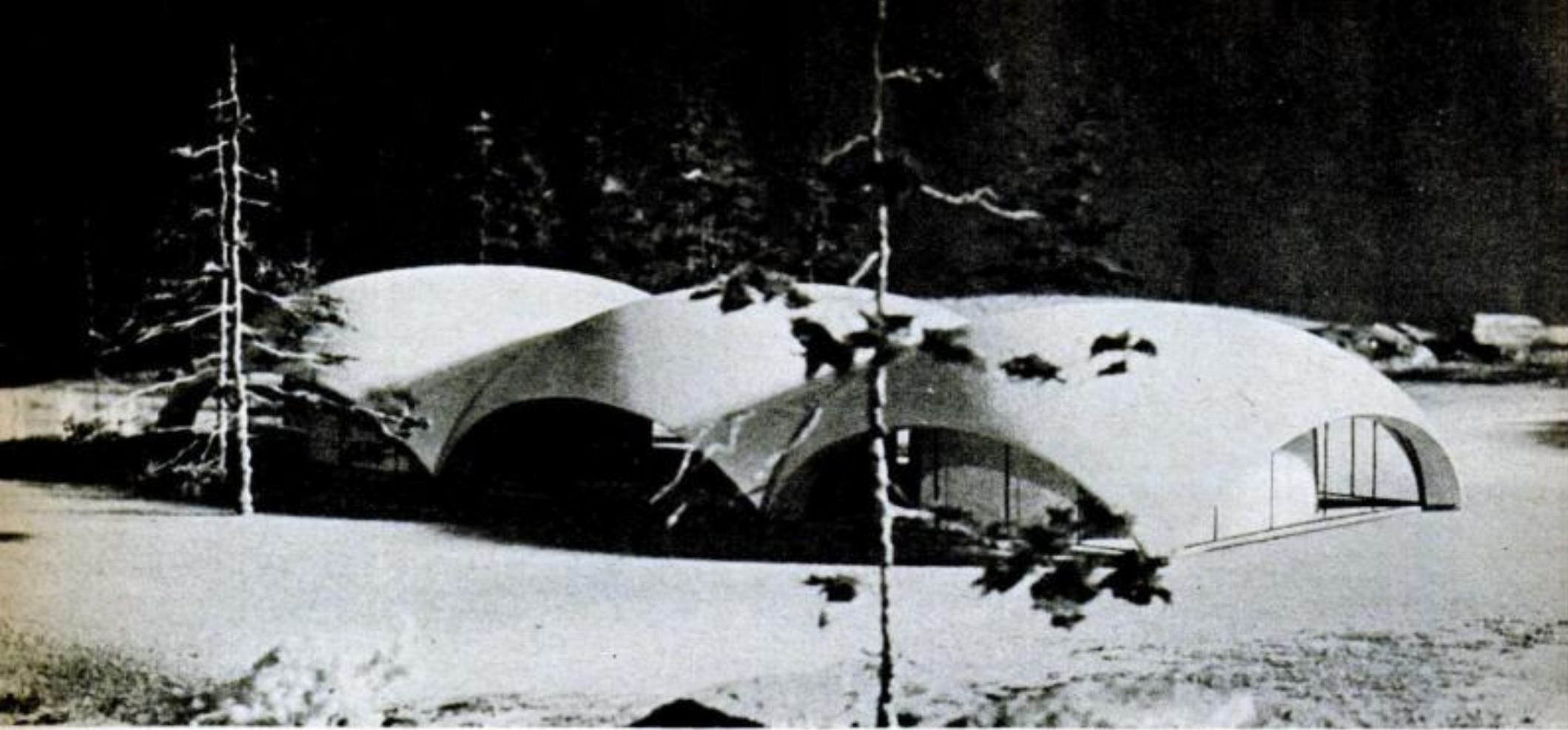
“Wonderful,” says 42-year-old Eliot Noyes, Harvard-trained modern architect and industrial designer.

“To live in a bubble house,” he expands enthusiastically, “is going to be a wholly new experience. Because the system of building them is economical, we shall be able to afford more space than in conventional houses. But it will also be a new kind of space and will feel very different from any houses ever built be-

fore. We are all used to living in box-shaped rooms with flat ceilings. Now we can live under great arching surfaces which curve overhead. And they will also be beautiful shapes outside.”

Economy of the bubble, or Airform, house is in the simplicity of its basic construction. Concrete is pressure-sprayed over an inflated neoprene-nylon bag. When the concrete has set, the balloon-like bag is deflated—and there is the shell of the house. It takes 24 hours to do the job.

The shape of the bag thus determines



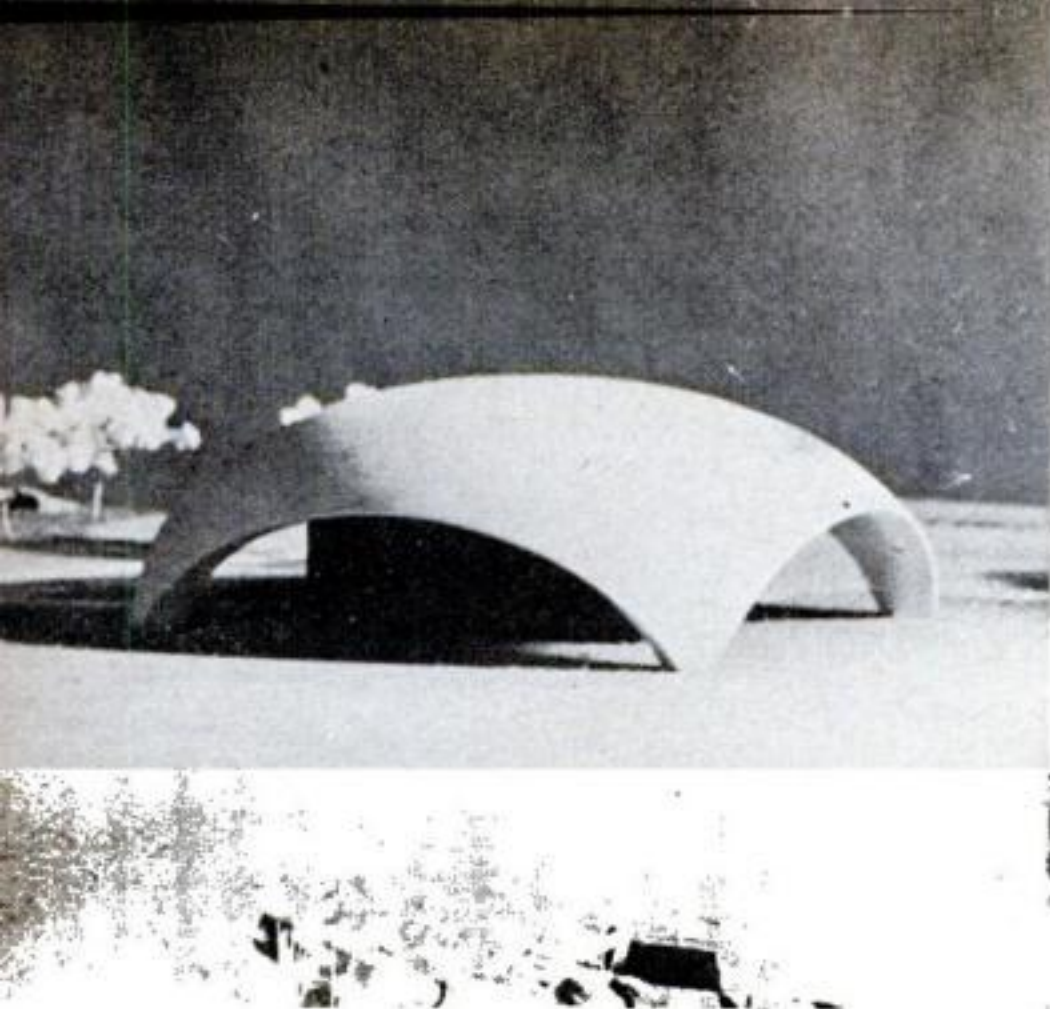
the shape of the house. It can be ugly or beautiful. It is all in the design of the bag. And that is where architect Noyes of New Canaan, Conn., comes into the picture, with the promise of 600 square feet of living space for around \$6,000. Two experimental bubble houses have just been completed at Hobe Sound, Fla. The models on these pages are larger, more elaborate—and more expensive.

The concrete-sprayed-over-a-balloon method of construction itself is not new. It was invented by a California architect, Wallace Neff, and is now controlled by the Airform International Construction Corp. of New York City. Aside from a few homes in California and the Southwest, and a group of experimental bubble houses in the East, most Airform construction as residences has been for mass



OPEN PLANNING like this is possible because no supporting beams or partitions are need-

ed. Where privacy is essential, partitions could be extended up to a false ceiling.



Triple Bubble Provides Separate Children's Area

LUXURY VERSION at left, with 3,000 square feet in triple bubble, has separate garage with plenty of room for two cars and space for tools and garden implements. One of side bubbles would have master bedrooms (right below) and guest room; other end unit would be children's play and sleeping area. Bubble in the middle would be a completely open, domed space to meet the living needs of the entire family (left below). Model was made to show Airform shapes and a possible arrangement. Doors and windows would be integral parts of bubbles.

housing in Venezuela, South Africa and Pakistan.

These served admirably in taking natives out of squalid huts into comparative luxury. But they were an ugly, igloo-like shape—with little thought to good design. One example was doors and windows, which were stuck on as appendages, having no relationship to the lines of the bubble form.

Recently Eliot Noyes saw the possibilities of this type of housing and, with the cooperation of Airform, has helped redesign the bag so that it will become a mold for bubbles beautiful.

With the bag supplied on a rental basis by Airform, any local contractor with concrete-spraying equipment can put up Noyes-designed bubble houses.—*Herbert O. Johansen.*



CURTAINS and low, room-dividing partitions would be used to a great extent for privacy.

People with hermit complexes, however, shouldn't live in bubble houses.



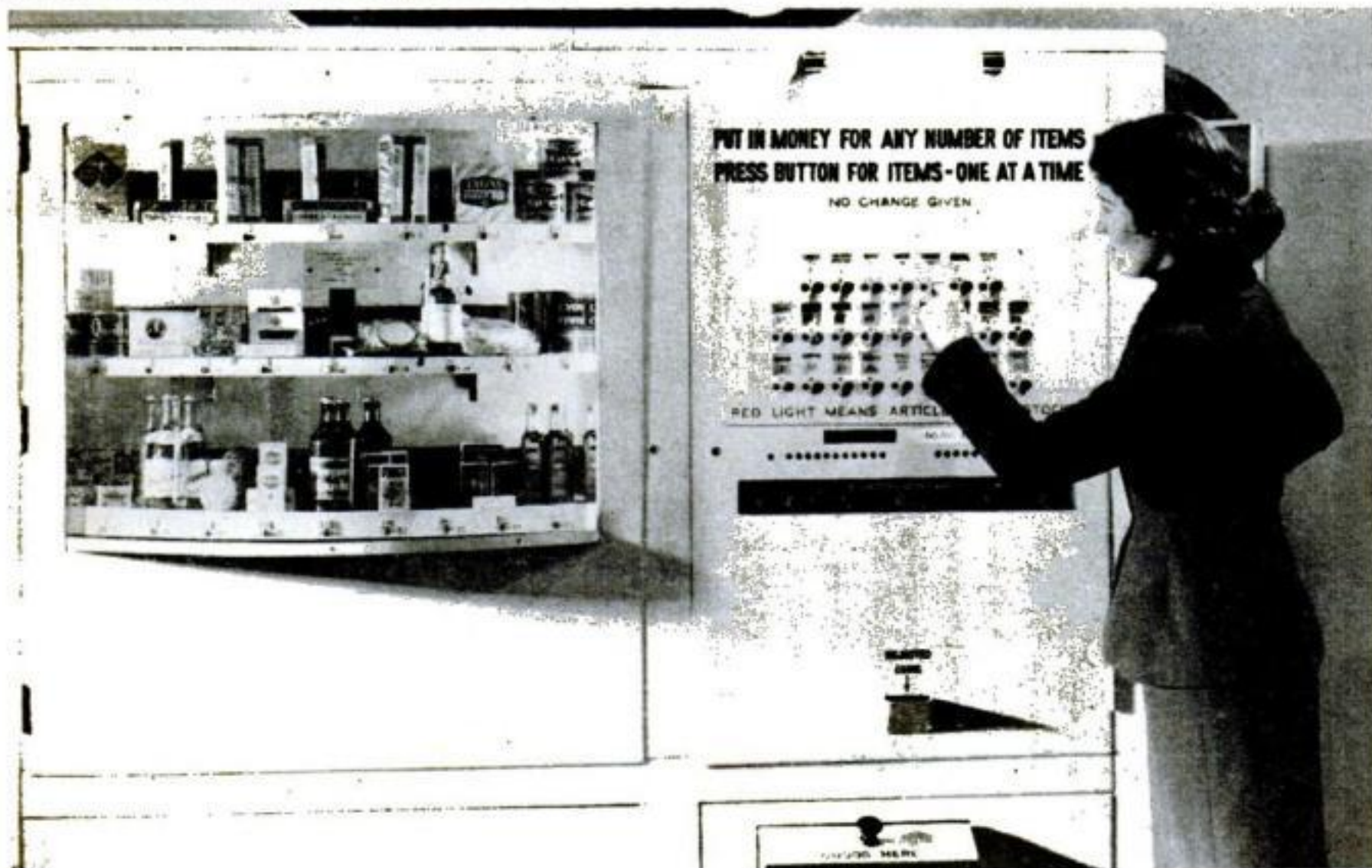
Coming Up... Mechanical Groceries

You Pays Your Money . . .

CUSTOMERS will carry around a combination key and adding machine to unlock shelves and total their purchases in an automatic grocery store now being planned. Raking the key over a toothed latch would free a can or carton and simultaneously spin gears to add the cost of the item to the bill. Gravity chutes will keep the shelves full. Clarence Saunders, veteran chain-store promoter, invented the "foodelectric."

. . . And You Takes Your Choice

THE English vending machine below gives a choice of 25 different grocery items. As each item drops down, its cost is deducted from the total amount of money you've put in and a cash balance appears on a lighted panel. You can keep on buying until the money fed into the machine is used up.



Brushes Bend to Coat TV Tubes

IF YOU'VE ever tried to build a ship in a bottle, you'll understand the problems of workers who paint the inside of TV tubes. In a 21-inch tube there are nearly 500 square inches to be covered with black graphite—an electrical conductor. As shown at right, the job is done at GE in less than two minutes with double-jointed paintbrushes.





Mechanical Woodpecker Keeps Creator in the Chips



A FLOCK OF YOGIS (left), spectacularly successful invention of Fritz Wigal of Jackson, Tenn., heads straight up a windowpane on suction-cup feet (shown in the inset).



A FELLOW by the name of V. F. Wigal, whom his friends call Fritz, will rake in around \$500,000 by next June because he invented a plastic woodpecker that can climb up and down walls and even walk across ceilings. The

bird's name, odd but simple, is Yogi.

You've probably run across Yogi already, for 100,000 gaudy copies of him are being turned out every day and 4,000,000 have been ordered since last June, when he first went on sale. His

nollow pecking, as he trudges up and down display windows, can be heard throughout the land—and in several foreign countries as well.

Yogi gets around, mostly vertically, on five vacuum cups attached to a ratchet powered by a key-wound spring.

No Good for Industry

Wigal was bitten by the germ of the idea for Yogi five years ago when he started idly fingering a vacuum cup that he'd found. Why not use a series of these things, taking hold and letting go in rotation, to make something move?

It took Wigal five years of strenuous part-time elaboration of this thought before he produced Yogi.

He tried first to apply the vacuum cup idea to some industrial process. That didn't pan out.

At last he decided to use the principle in a toy. He had already invented two.

What he needed now was an unusual toy. He finally settled on a woodpecker. People much more often see a woodpecker climb than fly, and the vacuum cups ought to be just the thing to turn the trick, he figured.

The first model was cumbersome and heavy. In it he had fitted vacuum cups to the prongs of a sprocket that was turned by gears powered by a clock spring. One trouble was that the cups gripped surfaces with such enthusiasm that it took an impractical amount of force to pry them loose.

So Wigal developed a new type of vacuum cup, one that would release itself easily and quickly. This enabled him to simplify his toy and reduce its weight from three-quarters of a pound to a little more than an ounce. Then he fitted five vacuum cups on a ratchet, which he "floated" on a horizontal axis inside the bird.

The spring, made of thin wire, surrounds the bird's axis and is wound by a key fixed to one end of the axis. As the spring unwinds the axis turns slowly, loosening the grip of one vacuum cup while forcing the next one against the surface Yogi is climbing. This goes on until the spring is wholly unwound. Then be ready to catch Yogi as he falls.

Wigal now works with Tigrett Enterprises in Jackson, Tenn., manufacturers of Yogi. He is a good-looking bachelor of 37, who at 14, in his native West Virginia, "invented" a hand-operated mechanism for changing the pitch of an

airplane's propeller in flight. A helpful patent attorney soon discovered for the bright lad that the same idea had been applied to the blades of steamboat propellers on the Ohio River 40 years earlier.

This setback gave Wigal a high regard for patent attorneys. To all would-be inventors, he says, "Get the best one you can to search the field for you before you waste time and effort on

an idea that somebody else may already have patented."

Rules for Inventors

Speaking with the authority of an inventor who has already struck it rich, Wigal also has these sound suggestions for the man who feels inventive:

1. Have a steady job while you invent. You can get mighty hungry waiting for an idea to pay off.

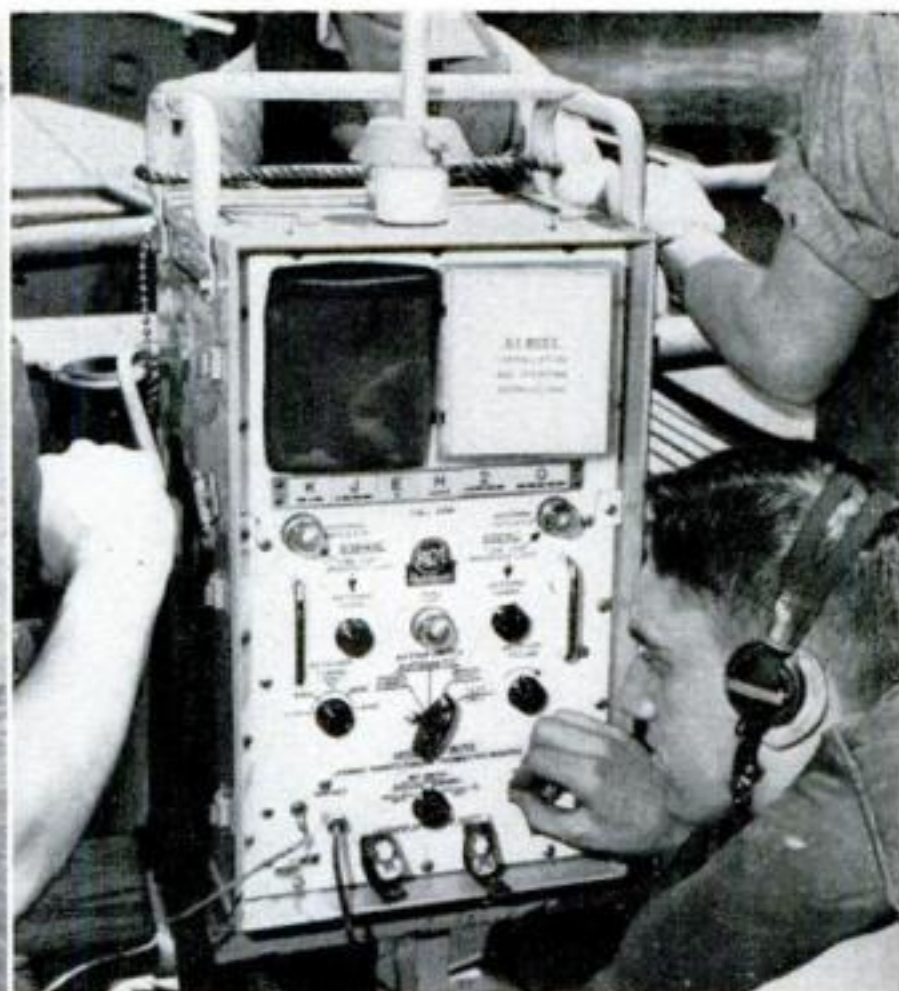
2. Don't discourage easily. Be satisfied if only a few of your ideas succeed.

3. Always ask yourself: "Is this idea something people need? Is it new and novel enough to appeal to them? If it's perfected, will it lure people into buying it?"

Maybe you can make half a million, too.—Robert P. Mahon Jr.



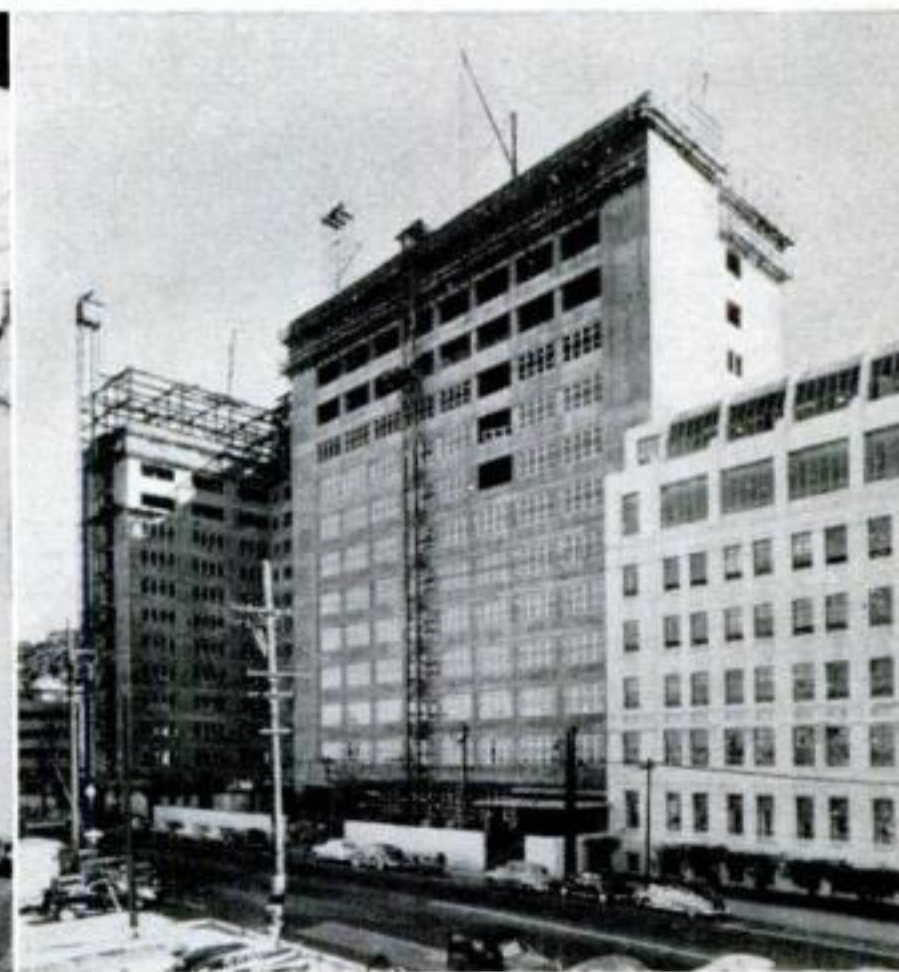
FRITZ WIGAL, 37, smiles contentedly at the plastic bird that is bringing him a fortune.



Shipwrecked Sailors Get Waterproof, Bump-proof Radio Station

A WHOLE radio station for shipwrecked seamen has been packed into less than two cubic feet. Drop it 20 feet into the sea and it just floats around undamaged, ready to be fished out and put to work. The new lifeboat set weighs less than 60 pounds, yet includes a two-frequency transmitter and

receiver, an automatic keyer, a hand generator for power supply, an antenna and a collapsible 15-foot antenna mast. The transmitter can be set to send automatic SOS signals as long as the generator is cranked, alternating between the two frequencies. Radiomarine makes it.



Fourteen-Story Building Quietly

THERE was no rat-a-tat-tat of riveters' guns to disturb patients of the hospital next door when the new Medical Sciences Building (right above) went up in San Francisco. The 2,000-ton framework was put together

Bolted, Not Riveted

with more than 70,000 bolts, tightened with power-driven wrenches (left above). Bethlehem Steel, which made the bolts, says the process is as fast as riveting, makes stronger joints.

APPROACHING CHICAGO, white express flags fluttering, Santa Fe's 62 ends its 62-hour dash from Bakersfield, Calif., with 24 refrigerator cars of fruit.

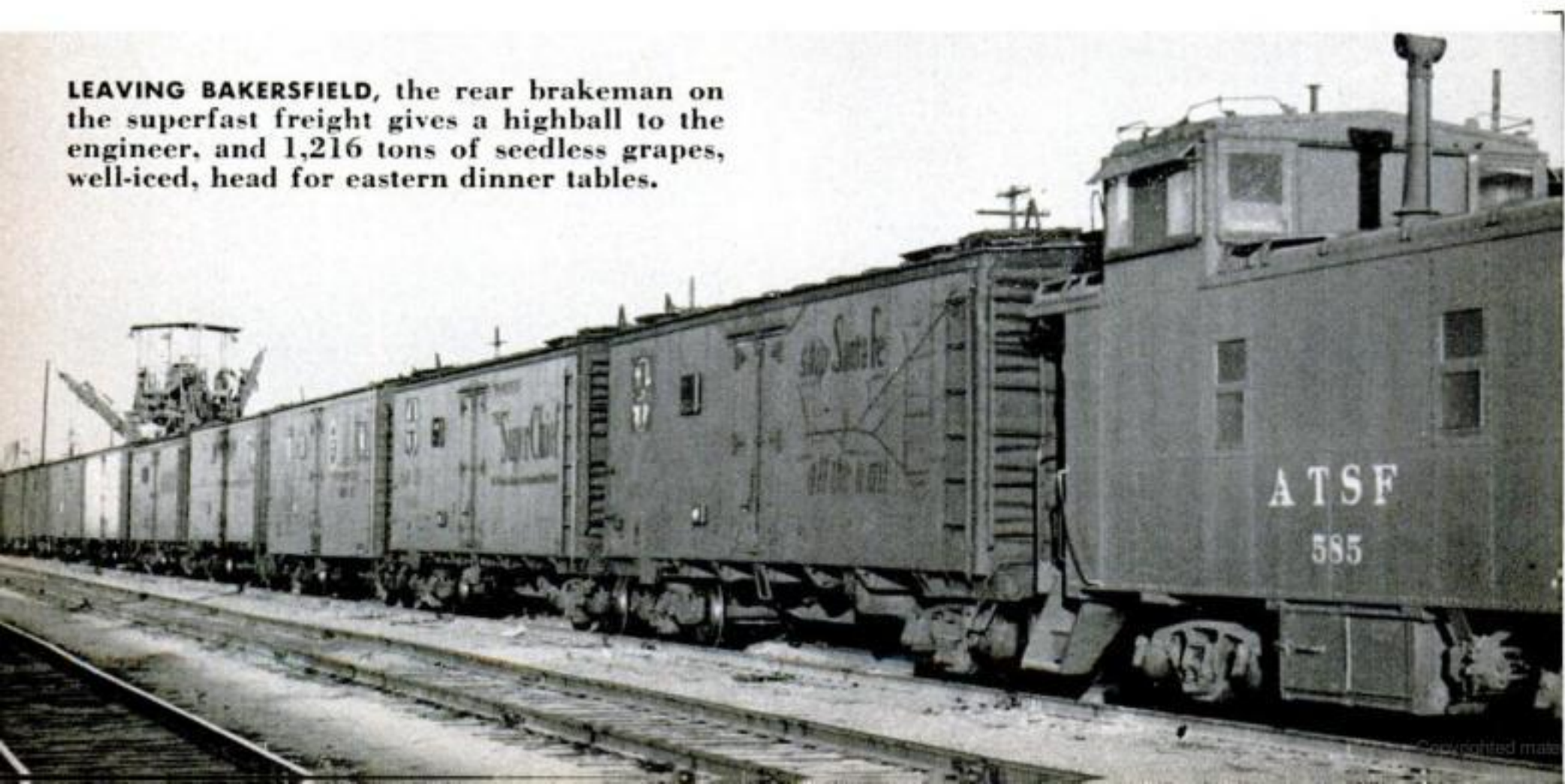
Photo from Trains & Travel



Grapes are whisked from California to Chicago on

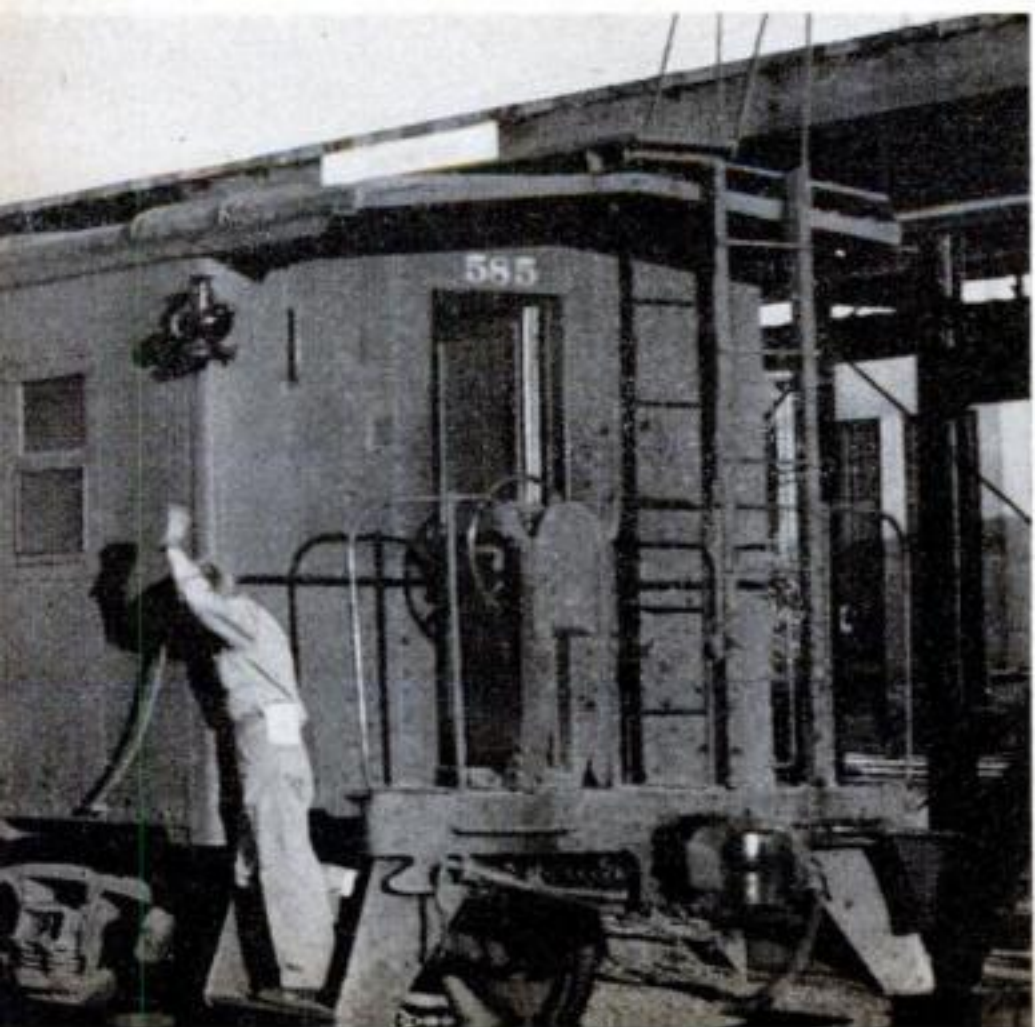
Fastest Freight

LEAVING BAKERSFIELD, the rear brakeman on the superfast freight gives a highball to the engineer, and 1,216 tons of seedless grapes, well-iced, head for eastern dinner tables.





Train



*Riding Santa Fe's No. 62
is as thrilling as racing
a sports car 2,195 miles.*

By Kenneth Wylie

IT IS nearing eight o'clock on a Thursday night in Bakersfield, Calif. At exactly eight, Santa Fe's No. 62, the world's fastest freight train, will pull out for Chicago with a consignment of two dozen refrigerator cars—"reefers," railroaders call them.

Only a relatively few hours before, vineyard men checked their crop of seedless grapes and found its average sugar content at just the right level for shipping.

The call went out for pickers, and soon stacks of thin crates started mounting in loading sheds beside the spurs and sidings where 62 is loaded.

Now stevedores are storing each reefer with 34,000 pounds of cargo.

Departure time ticks nearer, and the train crew is eager to take off. Now comes the icing show, staged by the railroad's Refrigerator Department—the R-D boys.

The R-D crew at Bakersfield takes over at 7:20 with an electronically controlled ice machine. This machine feeds on 300-pound blocks of ice, takes orders by radio and runs alongside the trains it services on its own set of 12-foot rails atop an ice dock.

Reefer Loaded in 90 Seconds

The bunkers of each reefer are loaded with around six tons of ice and a hefty sprinkling of salt. Total time for the whole train of 24 cars: 36 minutes, or one and a half minutes per car.

The icing is now finished, the wheel check is done, the conductor's flimsies are stuffed in his pocket and the engineer is in his cab.

The clearance comes.

"You've got a trainload, 62. Take off,"



FRESH FROM THE VINES, grapes are trucked aboard a "reefer," 34,000 pounds to the car. The cars get two icings on way to Chicago, where most are switched to eastern roads.

the intercom radio in our cab scratches, giving the engineer his control-tower okay.

The block signal ahead is green. The conductor gives his highball in the dim light, and No. 62 roars, spewing blue fumes as she heads into the darkness.

In no time we hit 60, running for the foothills. Cuts, trestles flash by. Woods and night sky slant up and away as we bank around curves.

"Watch us walk through the mountains," the engineer calls over the scream of his diesels. The fireman pushes open the engine-room door on his side of the cab and goes back to make a check.

We really do walk through those bare California mountains. The four 200-class Electro Motives whine as the grade begins to lift, but the only noticeable slowdown is for the twisting curves, some of them cutting far back in horse-shoes and loops. Behind us the string of reefers bucks and leans.

Two-thirds of a continent away lies Chicago. Fifteen train crews besides this one will work 62 before she slides into the Windy City, Sunday noon. That's nearly twice as fast time for the run as the standard freight makes. Only a few streamlined passenger trains better it. Plenty of passenger runs are slower.

We're on a premium train, all right. It came into being because million-dol-

lar California fruit growers were willing to pay special rates to get their fruit to the country's biggest markets as fast as possible. To cash in on the highest market prices for their goods, they pay \$1,169 for each carload.

Big, gruff Jim Mahoney, Santa Fe's superintendent of transportation, was largely instrumental in creating a special freight train to meet their needs.

The secret of No. 62's speed is not alone its rate of travel on open track. Santa Fe's high limit for freights is 60 miles an hour, and not even 62 can exceed this. Freight rolling stock won't take the pounding of higher speeds.

What makes 62 so extra-frisky is its unusually small number of cars (15 to 29) and preferential handling all along the line as an "express special." That means faster checking, faster switching, faster servicing.

We find that out after we have shot down from the Sierras, our wheels pounding a brisk staccato on the long slope to the Mojave. The desert is wide and cool, with nothing but clear semaphores going by.

New Hands and a Fresh Caboose

At Barstow, 141 miles out of Bakersfield, we come to the end of Santa Fe's first division going east, and 62 quickly changes hands. Even a new caboose, fitted out with its own bedding, towels, books, coffee and lunch materials, is wheeled in for the new brakemen and conductor.

This happens at every division point—about 137 miles apart—and as 62 rolls into each yard, wheel crews do a special job and do it in a hurry.

"Rigid inspection," read the orders wired along our route to each yardmaster, but in the 10 or 15 minutes we pause at these points, all the crew can be expected to do is make a fast survey for hotboxes. Dragging brakes and hotboxes are a constant threat on a sustained high-speed trip. But the road puts its best equipment on this train, and it's expected to hold up. The really stiff check will come in Kansas City.

At Cadiz, Calif., the four diesel units start to scream again as we go up, out of the arid lands, twisting high into the ridge that stands as a barrier between desert and Colorado valley.

At a quarter to midnight on the second day of our journey, flood lamps in the Belen, N. M., yards light the truss work of another great icer. The crews clamber over our reefers, spending only half a minute on each one to fill its bunkers with 2,400 pounds of ice.

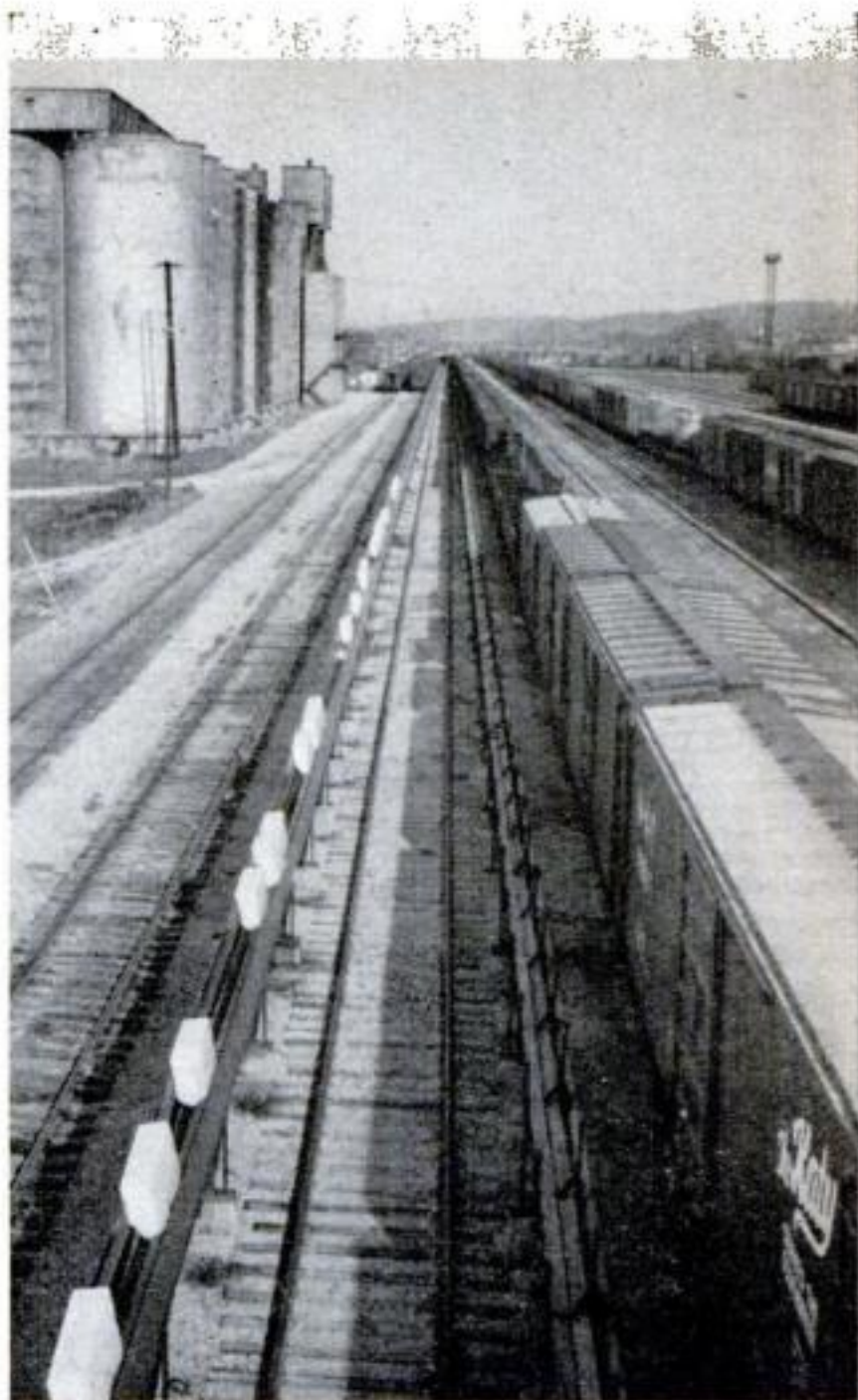
Advance Word Sent to Yards

Nearly 900 miles to the northwest, at the Santa Fe yard in Argentine, Kan.—the world's largest rail yard owned by a single road—the first steps have already been taken for 62's reception.

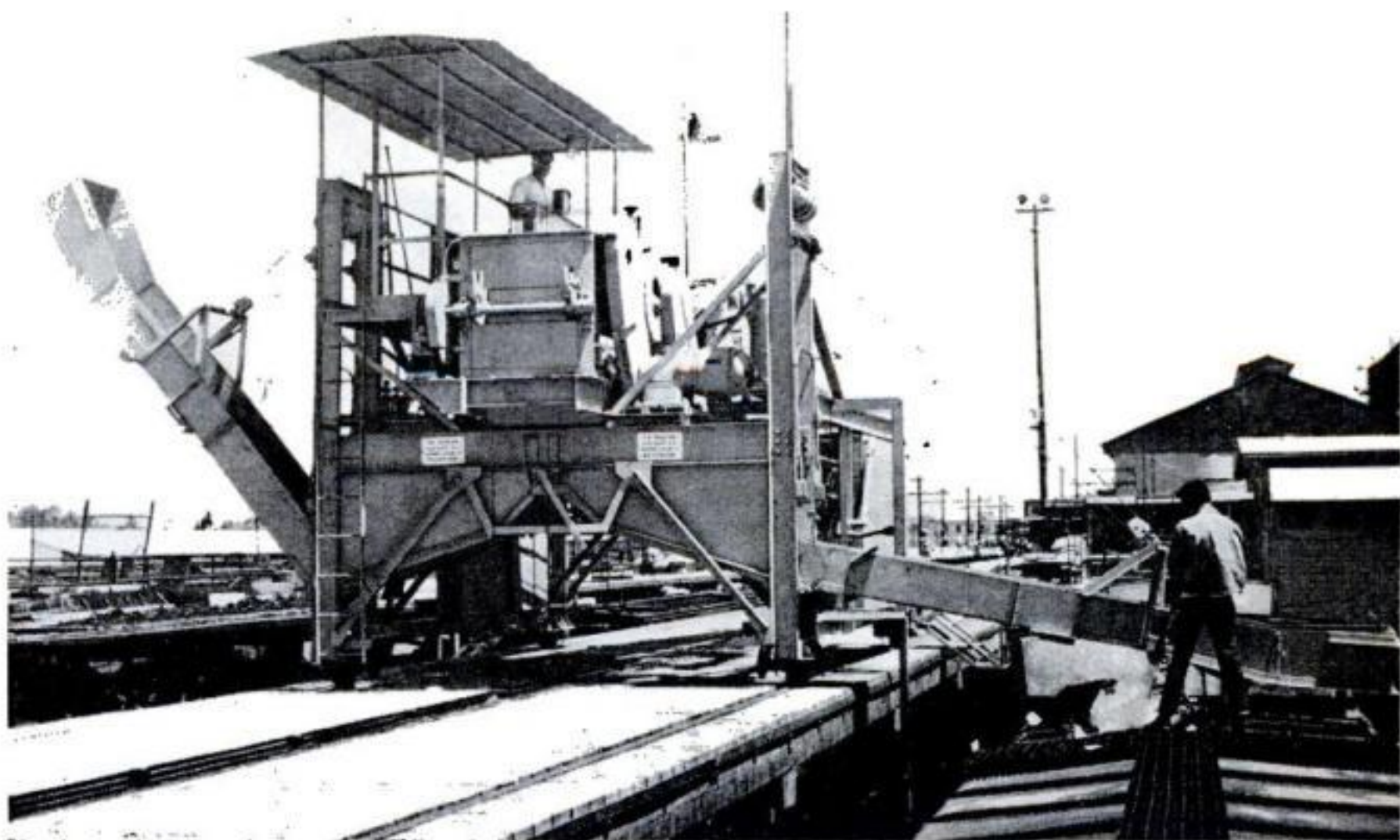
Before we left Bakersfield, word had been flashed to every division on the Coast, Western and Eastern lines of the road that we were coming through.

At 20 minutes after 10 on Saturday night, the big yellow circle of 62's headlight looms larger and larger beside the Argentine ice dock. We are exactly two hours ahead of schedule.

[Continued on page 242]



AT THE YELL "ICE," in the vast Santa Fe yards at Argentine, Kan., 300-pound chunks come rolling out on a conveyor from the Railway Ice Company's plant to the railroad's icer.



INTO THE ICER'S MAW go the chunks, which are then chewed up and spit down the elec-

tronically controlled machine's huge, armlike chutes, filling a reefer's bunkers in 90 sec.

I'd Like
to see them
make...

Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay \$5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



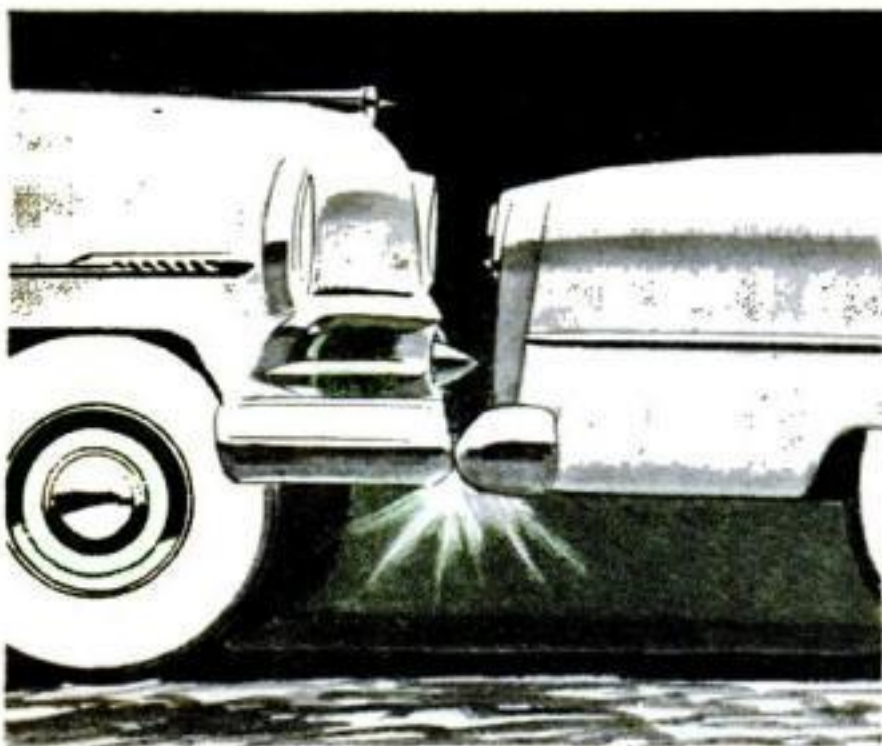
ICE-CREAM SCOOPS electrically heated so a housewife without the muscles of a lady wrestler could dig the stuff out of a home freezer.—*Jos. Benzing, Forest Hills, N. Y.*



A HEARING-AID CONVERTER that would let the wearer plug in on house current while listening to TV, to save batteries.—*E. R. Woolner, New Bedford, Mass.*



MOTORCYCLES with hand warmers built into handle-bar grips for winter riding. Current could be supplied by the cycle's regular battery.—*Arthur Hart, Hampden, Maine.*



FRONT SHOCK ABSORBERS interconnected with hydraulic brake lines to keep front of car from diving on hard stops and prevent locked bumpers.—*M. H. Muecke, Pasadena, Tex.*



OVERSHOES with nonskid soles that wouldn't wear off. Mixing an abrasive in with the rubber for better traction might increase wear, too.—*Frank Eagan, Blasdell, N. Y.*

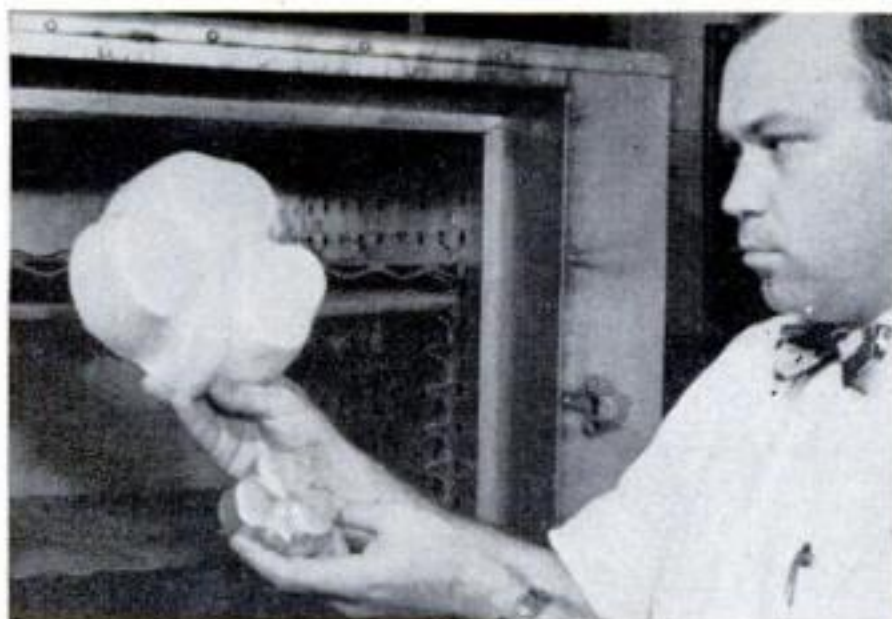


"Rocket Water" Yields New Wonder Products



ANTI-TB DRUG, put up in vials by Pfizer, is a life-saving derivative of hydrazine.

MAKING PLASTIC EXPAND is feat of hydrazine. Here are product and its mold.



TO SAVE MOWING, hydrazine chemical, MH, is sprayed on grass along a highway.

ONION SPROUTS can be curbed or wholly stopped with hydrazine preparation.



*The chemist's wand works magic with hydrazine,
war-born fuel, as big-scale production begins.*

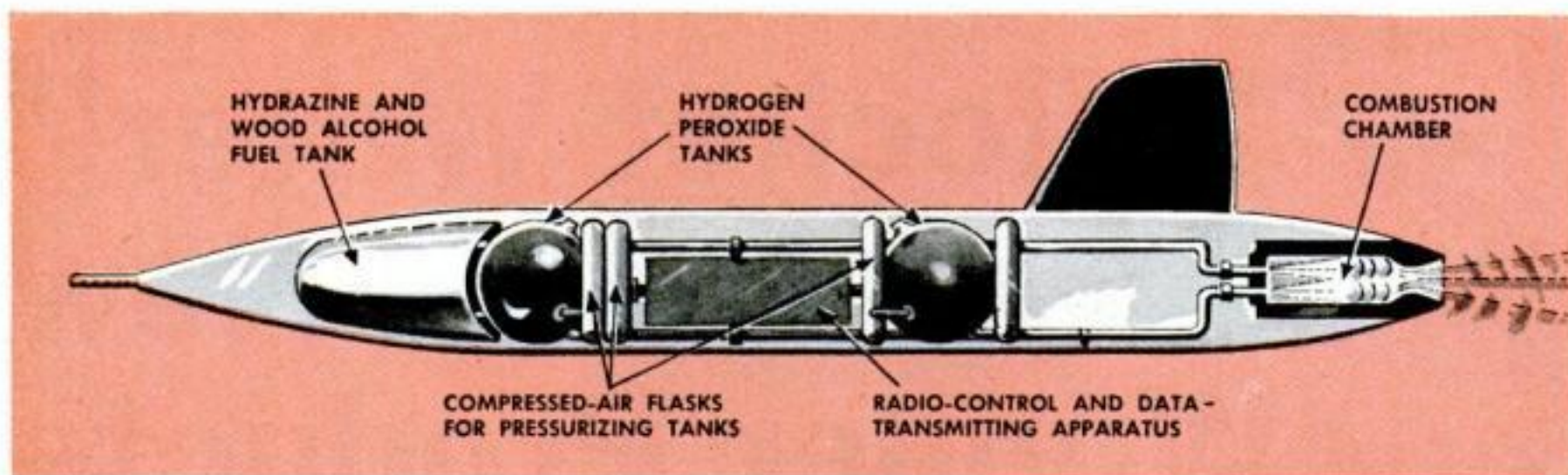
By Herbert Yahraes

IT LOOKS like the water from your faucet. It boils and freezes at just about the same temperatures as water. But this strange liquid, called "rocket water" by laymen and hydrazine by chemists, will take fire and burn with

a blue flame. It is just going into quantity production in the U. S.

Some consider hydrazine one of the best bets for fueling rocket-powered warplanes and guided missiles. It may be the stuff that will push the first spaceship free of the earth.

And with its aid, the chemists have



TYPICAL hydrazine-fueled guided missile is illustrated by simplified sectional view of a re-

search type. Steel combustion chamber has $\frac{3}{8}$ -inch-thick lining of heat-resisting carbon.

already taken off on adventures into new worlds. For hydrazine serves as the starting point for making a myriad of new products. In some of its latest derivatives, it proves a veritable elixir of life. If you get sick, drugs based on hydrazine may make you well.

Other hydrazine compounds will help you control weeds, and even keep the grass of your lawn at just the right height, saving frequent mowing. You can buy your children a wonderfully light beach board made with the help of a hydrazine derivative. Under development is a whole family of new plastics, dyes, textiles and other products, all based on hydrazine.

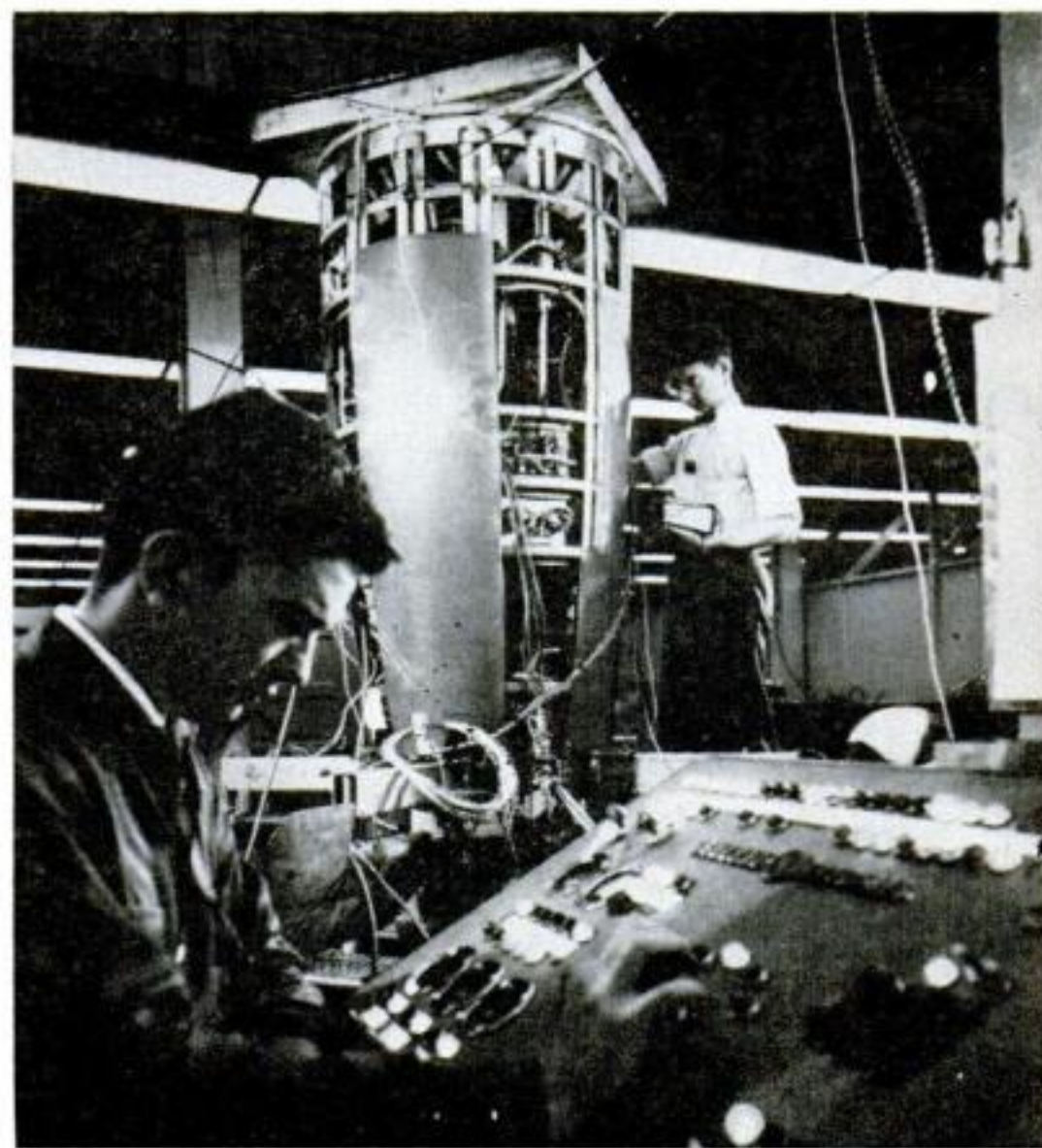
What Hydrazine Is

The men who handle rocket water wear rubber gloves and goggles, for it is toxic and corrosive. It smells like ammonia, of which it is a close relative. Both consist of nitrogen and hydrogen. Hydrazine has the chemical formula N_2H_4 ; ammonia, NH_3 . In other words, a hydrazine molecule contains two atoms of nitrogen and four of hydrogen, instead of an ammonia molecule's one atom of nitrogen and three hydrogen atoms.

A German chemist, Emil Fischer, predicted the discovery of hydrazine and named it as long ago as 1875. Isolating it took 12 years more, and the chemists who worked with it later found it hard to make and extremely costly. It might have remained little more than a chemical curiosity but for a startling development during World War II—

rocket-powered planes, introduced by the Germans late in the war.

To produce a lightweight, high-energy fuel for these planes, the Germans in 1944 disregarded costs and built the first two sizable hydrazine plants. The process used was originally devised by Friedrich Raschig in 1907. A familiar bleaching agent, sodium hypochlorite, broke down ammonia. The products—chloramine and caustic soda—reacted with more ammonia to form common salt, water and hydrazine. Simple as it



GUIDED-MISSILE TESTS using hydrazine, and other fuels, have been under way at Army Ordnance test station, Malta, N. Y. Above, engineers check wiring of prototype model.

sounds, making it work was a headache. Hydrazine tended to break down before it could be recovered. And at best, the output contained only about two percent of hydrazine, and had to be concentrated. Nevertheless, the larger plant of the two produced more than 40 tons of hydrazine monthly.

It was hydrazine that provided much of the zip for the world's first rocket plane—the German's Me 163 interceptor. Its Walter rocket engine was fueled by a combination called T-Stoff and C-Stoff. T-Stoff was hydrogen peroxide, and supplied oxygen for burning the fuel. C-Stoff was hydrazine and wood alcohol, with a dash of copper salts to speed hydrazine's explosive reaction. The 415-pound engine, developing a maximum thrust of 3,740 pounds, gave the plane a climbing speed of seven miles a minute and a top speed of 590 miles per hour. Hydrazine helped fuel a second rocket fighter, the BP-20.

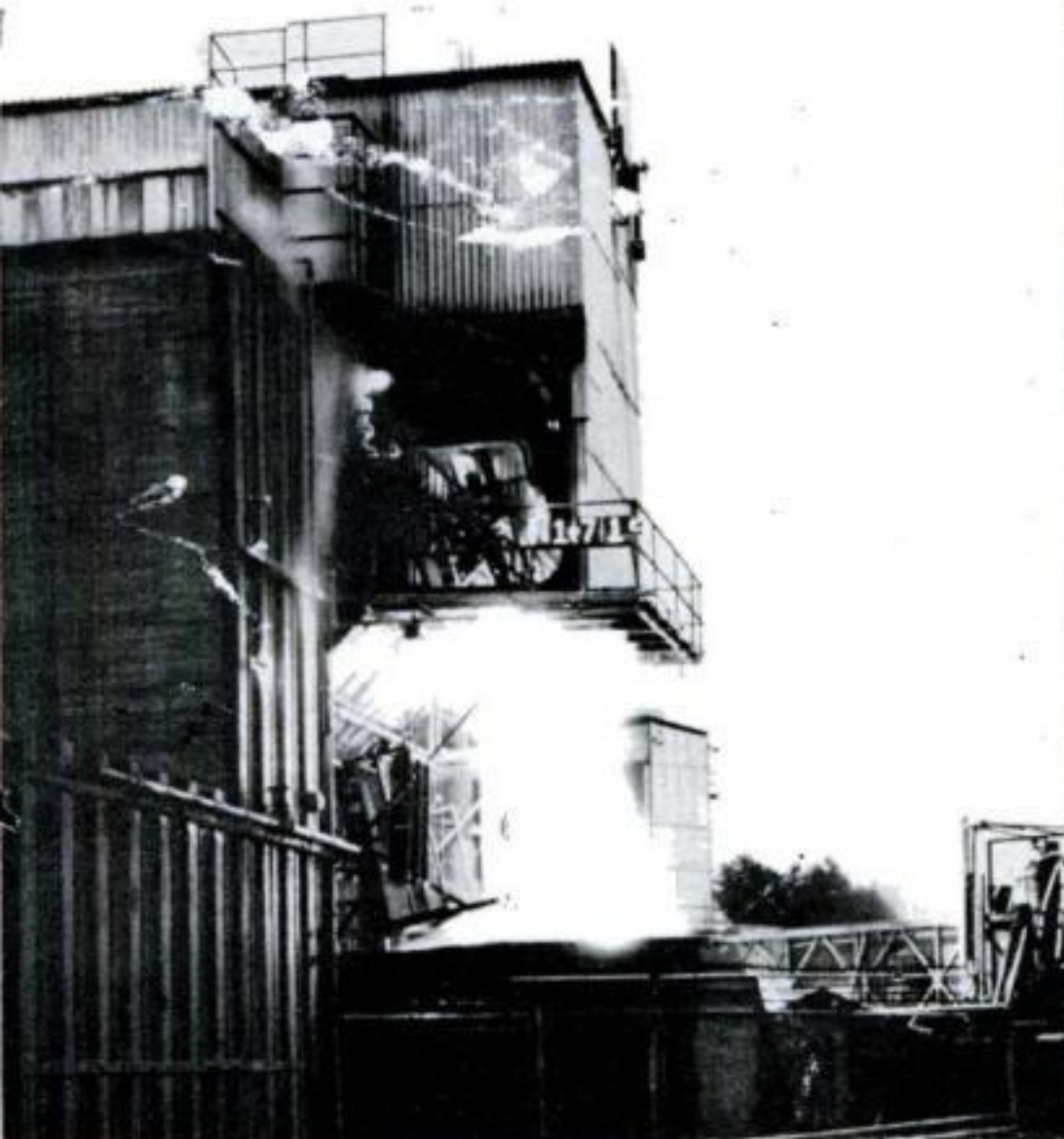
After the war, U. S. scientists and engineers consulted with German rock-

et authorities, and studied the German hydrazine-making technique. Soon our armed forces began letting contracts for experimental work with hydrazine. In one such project, rocket motors burning hydrazine and other fuels have been undergoing trials in concrete-walled pits of Army Ordnance's 3,000-acre rocket station near Malta, N. Y.

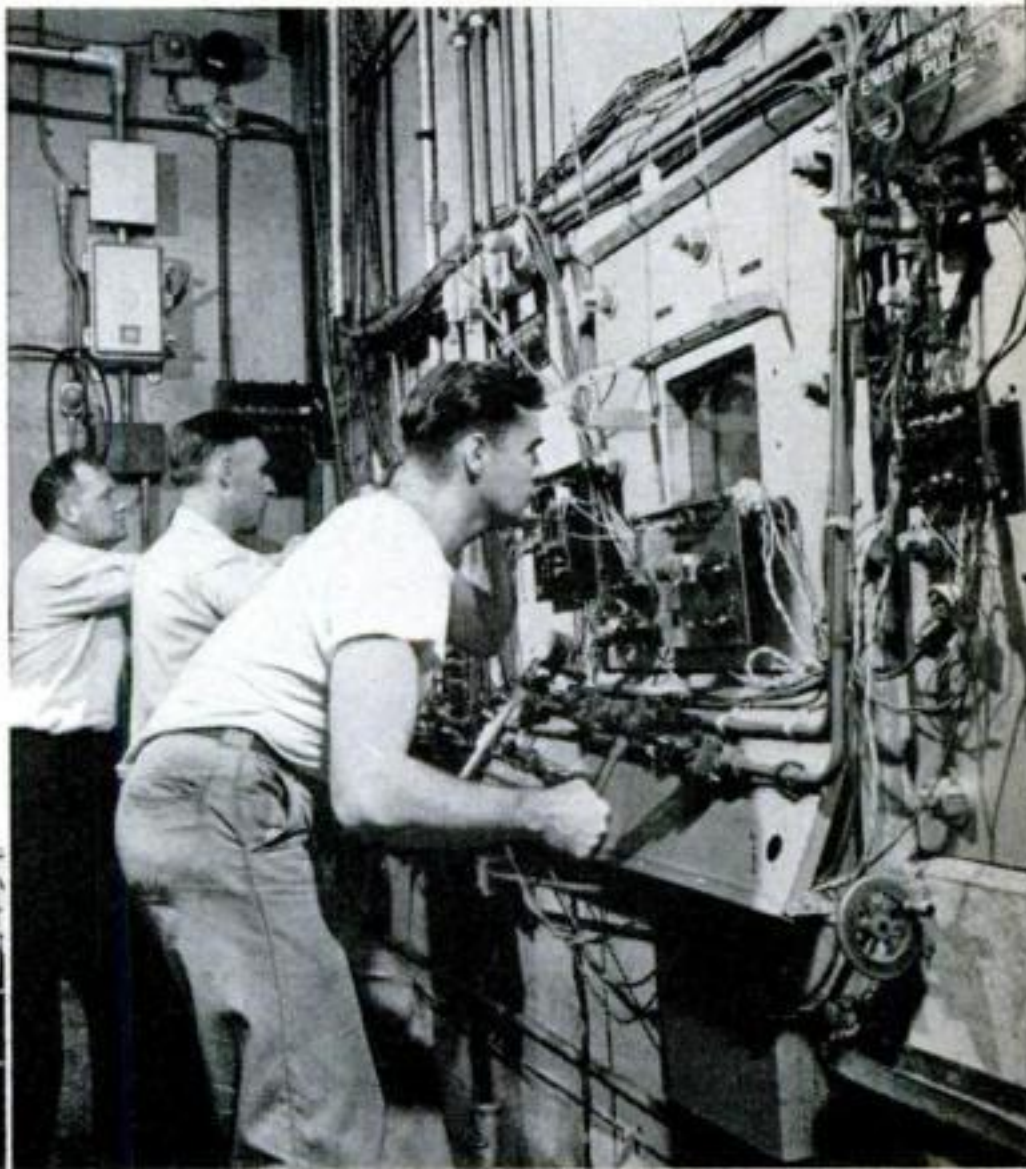
Secrecy Cloaks Progress

Results are hush-hush, and military men aren't talking about what fuels are currently used in our guided missiles. But the experts can point out this much without violating security: making hydrazine requires no strategic materials. It's easy to handle and store. As a fuel it's packed with energy, readily releasable. It ignites spontaneously and burns rapidly on contact with nitric acid or hydrogen peroxide, which act as oxidizers. It breaks up into lightweight particles that zip away at high speed, and so produce a powerful thrust.

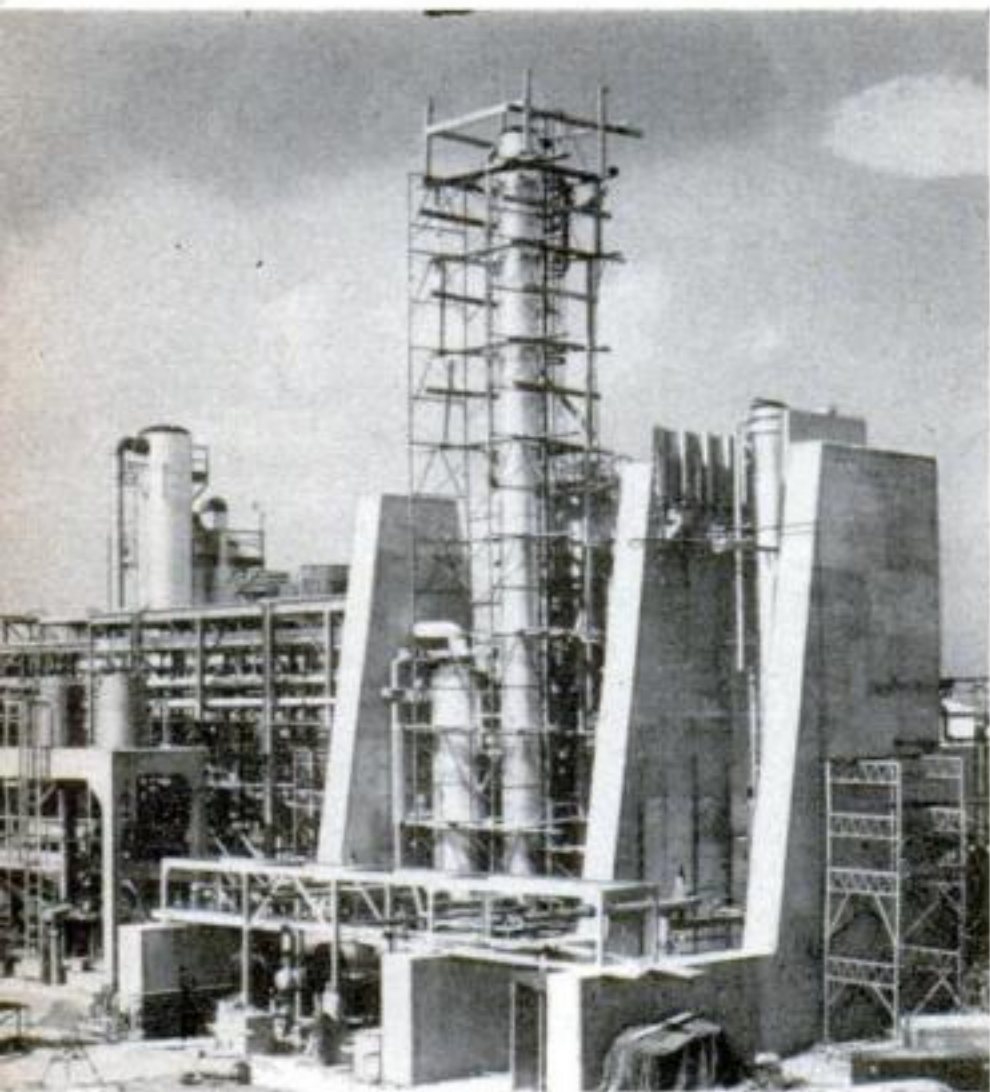
These facts make hydrazine one of



ROCKET ENGINE roars into life as propellant is ignited in one of station's concrete test pits. Some of the models tested have developed a thrust of upward of 35,000 pounds.



ENGINEERS in control tower, at safe distance from test pit, work valves governing flow of fuel and watch through windows. Emergency control will douse pit with sprinkler system.



FIRST IN U.S. to make hydrazine by the ton is this new \$3,000,000 plant at Lake Charles, La. Massive concrete bulkheads (foreground) are to limit damage in case of an explosion.

the most promising of rocket fuels, perhaps *the* most promising. And it's no secret that U. S. production of "rocket water" is undergoing an unprecedented boom, with most of American makers' current output going to meet the needs of the armed forces.

Big U. S. Output Starting

Really large-scale U. S. production of hydrazine is just getting under way. With completion last year of a \$150,000 plant at Newark, N. J., the Fairmount Chemical Co., a pioneer American maker of hydrazine since 1940, quadrupled its output. And now a great \$3,000,000 hydrazine plant at Lake Charles, La., has been put in operation by the Matholin Corp.—a new company devoted to manufacturing hydrazine, and conducting research on it, formed jointly by the Mathieson Chemical Corp. and Olin Industries, Inc. Military requirements are expected to take most of this plant's initial output, but it will also be able to supply a growing demand for hydrazine for non-military uses, its sponsors say. And although the Lake Charles plant's

exact capacity is cloaked in military secrecy, they call it the first in this country to make hydrazine "on a tonnage scale."

Basically the method remains the Raschig process that the Germans used, but in U. S. producers' hands it has undergone important engineering improvements. And ways have been found to remove most of the 36 percent of water that the final German product contained, so that anhydrous or virtually water-free hydrazine, superior for many applications, is now commercially available.

The chemical is shipped in stainless-steel drums, from which air has been excluded by pumping in nitrogen gas. This meets safety requirements for transportation by truck or rail. In a closed space, hydrazine vapor and air would form an explosive mixture, which could be touched off by heat, a static spark or even simply by contact with certain iron or copper compounds. But in the open, hydrazine is considered fairly safe to handle, no more dangerous in fact than gasoline.

2,000 Different Products

As an industrial raw material, hydrazine may be transformed into substances with a wide range of chemical structures—more than 2,000, at latest count, and many with brand-new characteristics. Chemists have already developed a number of commercially valuable derivatives.

One of the most spectacular is the chemical that can help you have a well-groomed lawn with only one or two mowings a season (PSM, March '53, p. 123). This is maleic hydrazide, or MH for short, made by the Naugatuck Chemical Division of U. S. Rubber Co.

Sprayed on grass, MH retards growth for six or eight weeks. It also looks good against certain weeds, particularly wild onions and garlic. Recent tests indicate, too, that it will help control quack grass, the bane of many a home gardener. (In these tests, the weed was sprayed with MH and plowed under. Then a crop was planted.)

MH will do more important work. Sprayed on onions two weeks before they are harvested, it keeps them from sprouting all winter—without affecting color, odor or flavor. Potato plants sprayed with it yield a crop that can be stored without loss of sugar content. Tobacco plants treated with it won't produce suckers—a secondary growth that cuts both yield and quality.

Hydrazine Attacks Poultry Disease

Other hydrazine products have agricultural value. Added to feed, one helps to prevent the poultry disease, coccidiosis. Another kills mites without killing the birds that feed on them. Others look like good insecticides.

Starting with hydrazine, U. S. Rubber Co. chemists have developed a new blowing agent—the thing that puts the sponge in sponge rubber and sponge plastic. The company calls it Celogen but chemically it is benzene sulfonyl hydrazide, or BSH. At normal temperatures, BSH is a white powder, but add it to a batch of rubber or plastic at temperatures above 135 degrees C., and it breaks down and liberates nitrogen gas. This leavens the material much as carbon dioxide, produced through the action of yeast, leavens bread.

One BSH end product is a beach board made of vinyl-plastic sponge. It weighs only 12 ounces, and its millions of tiny nitrogen-filled cells enable it to support up to 150 pounds in the water. More possible end products: sock pads, aircraft-wing lining, rug underlays, fishing floats, mine-cable floats, life rafts.

Yields Life-Saving Drugs

Using hydrazine in a different way, chemists get drugs for saving life. Most dramatic of these, to date, has been the new antituberculosis drug INH—short for isonicotinic acid hydrazide. Now an improved form called streptohydrazid has been announced by a Brooklyn pharmaceutical firm, Chas. Pfizer & Co. It combines the two most effective anti-TB drugs, INH and streptomycin, and is

[\[Continued on page 262\]](#)

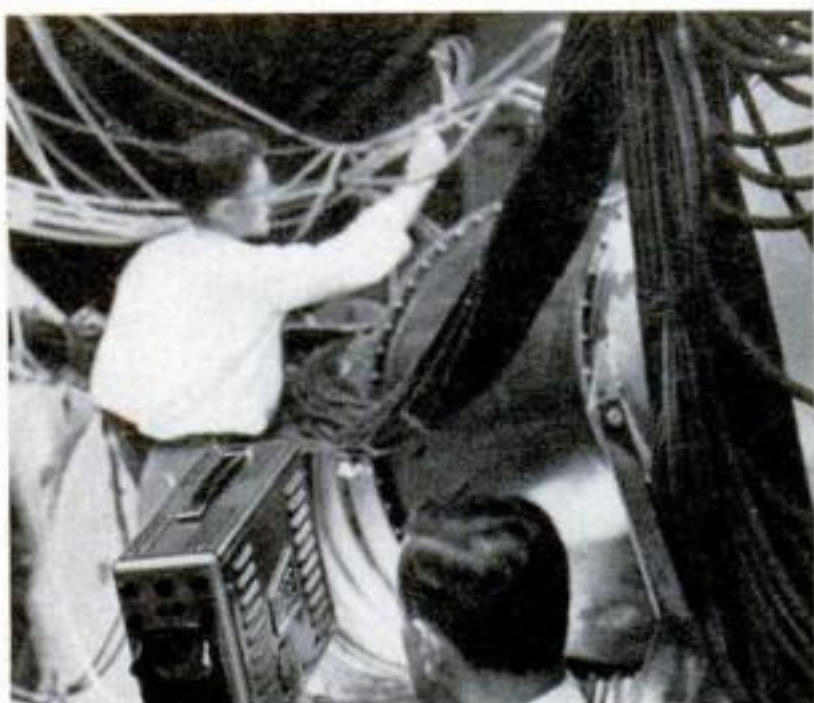
What Are They Watching on Television?



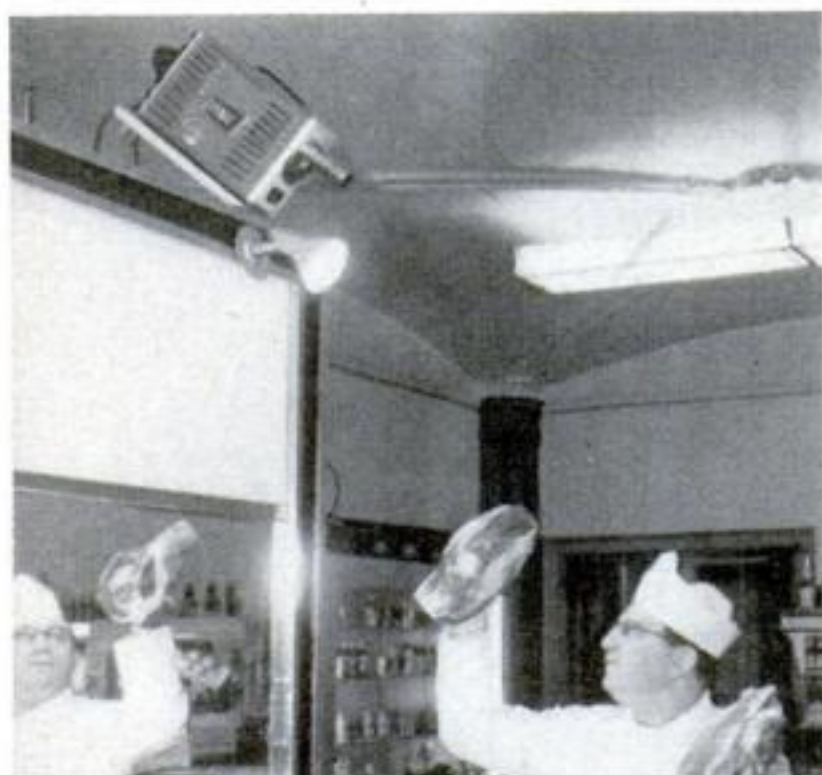
The pictures that interest these three people are far, far removed from "Lucy." Can you guess what they are? Turn the page for answers.



...TV on the Job



1 AIRPLANE-ENGINE TESTS are televised by Pratt & Whitney. Engineer (photo No. 1, preceding page) sees instrument wires.



2 BUTCHER SHOWS HIS WARES to residents of Chicago apartment hotel. Shop is connected to the hotel's master antenna.



3 RED-HOT STEEL STRIP is telecast as it leaves rolling mill to let operator "see" around water sprays and control the mill.



Welded-Steel "Basket Handle"
Bridges River in Mexico



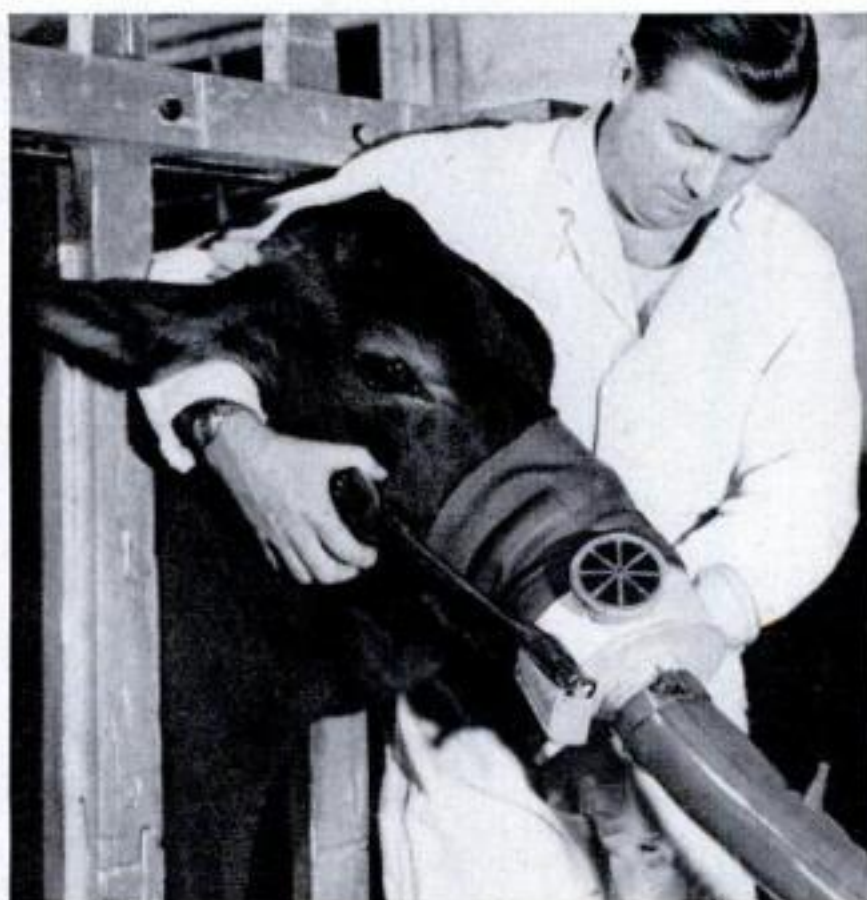
Mercedes Flips Its Grille

LIFT the hood of the German Mercedes 180—and the radiator grille comes right up with it. The four-cylinder, 52-horsepower engine boots the new car along at better than 78 miles an hour, putting 27 miles behind it for every gallon of gas swallowed.



INCLINED steel arches welded together at the top are the unusual support for this new bridge over the Rio Blanco near Veracruz, Mexico. It's painted, too—the arches orange,

the horizontal tie girders cherry red. The design idea won a Lincoln Arc Welding award for Dr. Thomas C. Kavanagh of New York University.



Wanted: Hot-Weather Cow

THIS bossy is masked for breathing in a climate chamber so researchers can tell how well she can take it in the deep South. It's part of a government crossbreeding program to produce a cow that won't hit a low in milk flow when temperatures soar.



B-36 Doubles as Cargo Carrier

THAT old warhorse—the B-36—is hauling freight now. In each wing-pod saddlebag, the bomber above toted two B-36 engines and two quick-change engine assemblies across country to show how plane parts could be shuttled to and from forward areas.

Nash Hikes Compression,

This L-head has the highest compression yet, but it still does its stuff on regular gas.

By Wilbur Shaw

THE Nash Statesman for 1954, sparked by a whopping 8.5-to-1 compression, cuts a good middle course between lively performance and comfort.

For years this Kenosha, Wis., outfit has puts its emphasis on comfort. Its cars have been noted for soft ride, fancy up-

holstery, double beds, and reclining seats. With this model, which shares with Buick the highest compression among U. S. stock cars and has the highest compression of any L-head, Nash has definitely changed its emphasis to engine.

The Statesman you'll see next year won't look much different—an altered hood line, restyled grille, and a Continental spare. But if you get in and drive it, as I did, the changes will be about as striking as the Petty-girl ornament on the prow.

The six-barrel L-head is basically the same engine that Nash has been using in



THAT'S PLENTY of cargo space in there, and for '54 it's made even bigger by hanging the spare outside. Apart from the fact that the car looks snappier, an outside spare means you don't have to unpack luggage on a roadside if you get a flat on a trip. That shelf behind the rear seat is steel—not fiberboard.

DUAL SPEAKERS—there's one like this on the other side too—let you catch soap operas or news with both ears. This seat folds down at night to make part of a double bed but doesn't recline for daytime snoozing like the other half of the front seat—too many guys are asleep at the wheel already.

Puts Spare Tire Outdoors

its middle line of cars for years. The idea this year was to put a more powerful car on the road but still use this proven block and regular gas. Main problem: how to get more horses without letting it ping like a bunch of Swiss bell ringers.

Earl Munson, chief engineer at Kenosha, told me that his boys simply stole a glance at some favorite hot-rod tricks. They tossed in some of Nash's own, with this result: 110 horses, 10 more than last year, plucked from a 195-cubic-inch engine. The bigger Ambassador has been hiked from 120 to 130 hp.

First, they relieved the "dam" of iron in the standard block between the top of

the cylinder wall and the valve ports. This lets the fuel mixture and the exhaust whip in and out in a straight line. Then they tossed out the old cast-iron head and substituted a high-compression aluminum one.

Munson explained why Nash went to aluminum:

"If you want more power from the same engine, one way to get it is to boost compression. Then you get both higher compression pressure and temperature, with resultant knock. You get it, that is, unless you avoid it by lowering either pressure or temperature.

"That's where the aluminum head





CONCAVE GRILLE is the most conspicuous style change in the new Statesman. When I first saw the car coming, I thought it was floating loose in there. Hidden brackets hold it.



PULL-OUT BIN in the center takes all those odds and ends that come tumbling out of an ordinary glove compartment whenever you open the door.



CONTINENTAL SPARE doesn't interfere with access to the luggage compartment. Outdoor spare is standard on a new Nash Rambler four-door built on a longer 108-in. wheelbase.

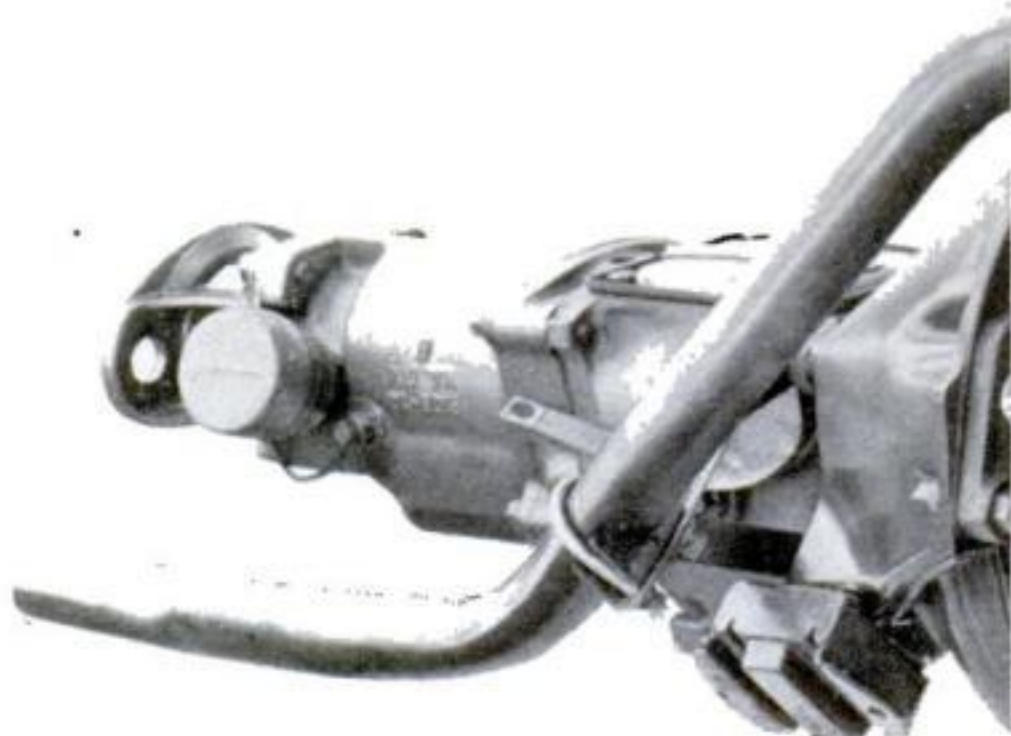
comes in. It dissipates heat much faster than iron. There's a simple formula to illustrate the problem:

"Using the letter P for compression pressure, T for temperature, and PK for maximum permissible knock, we can set up a formula, $P \times T = PK$. Let's say that PK in this case is 12. So for our purposes no product of P and T can be more than 12. Suppose with the older engine P is 4 and T is 3. That's all right, but we want to get more horsepower, and we want to get it by raising compression without raising PK above 12.

"The solution we found was to lower the compression temperature to, say, 2—which let us raise the pressure to 6. You can see that a cooler aluminum head is a vital link in the process."

With their relieved block and high compression, the engineers had a hot baby on their hands that gulped for air and put out exhaust at unusual rates.

DUAL CARBS take air from the filter through a big tee connection. That aluminum head helps Nash run at 8.5 compression on ordinary gas. There's a new straight-through muffler that slices maximum back pressure in half, with a resonator on it to preserve Nash's typically quiet purr. They did things inside this power plant too—enlarged the intake manifold, relieved the block a little, put in bigger valves and a high-lift cam. Those two asbestos-covered lines running up from the exhaust manifold lead heat to automatic chokes—the carbs themselves sit on insulating gaskets to protect them from engine heat and vapor lock.



Dual carbs, improved valves and cam shapes, and a new exhaust system were next on the docket.

After we went over the engine, I took one of the four-door sedans out on Nash's track. The ride is amazingly soft, and the car handles about as well as you could wish for with such gentle springing. We got up to 80 easily on the 1¼-mile oval, but since the track is only slightly banked, I didn't try to shove the sedan higher. There was plenty of pedal left.

Braking was good. They have widened the front brake shoes from 2 to 2½ inches. I am glad that Nash is one company that doesn't just put in more power and let it go at that.

END

FACTS ON '54 NASH STATESMAN

Model: Statesman four-door sedan.

Engine: 6-cyl. L-head; 110 hp. at 4,000 r.p.m.; compression ratio, 8.5:1; piston displacement, 195.6 cu. in.; bore and stroke, 3⅞" by 4¼"; piston travel (in feet per car mile at 20 m.p.h.) 1,766.96; torque, 155 lb.-ft. at 2,000 r.p.m.

Weight: 3,045 lb.; per hp. 29.0.

Transmission: 3-speed manual shift; overdrive or Hydra-Matic optional; rear-axle ratios, 3.6:1, 4.4:1, 4.9:1.

Steering ratio: 24:1; radius of turning circle, 21'3".

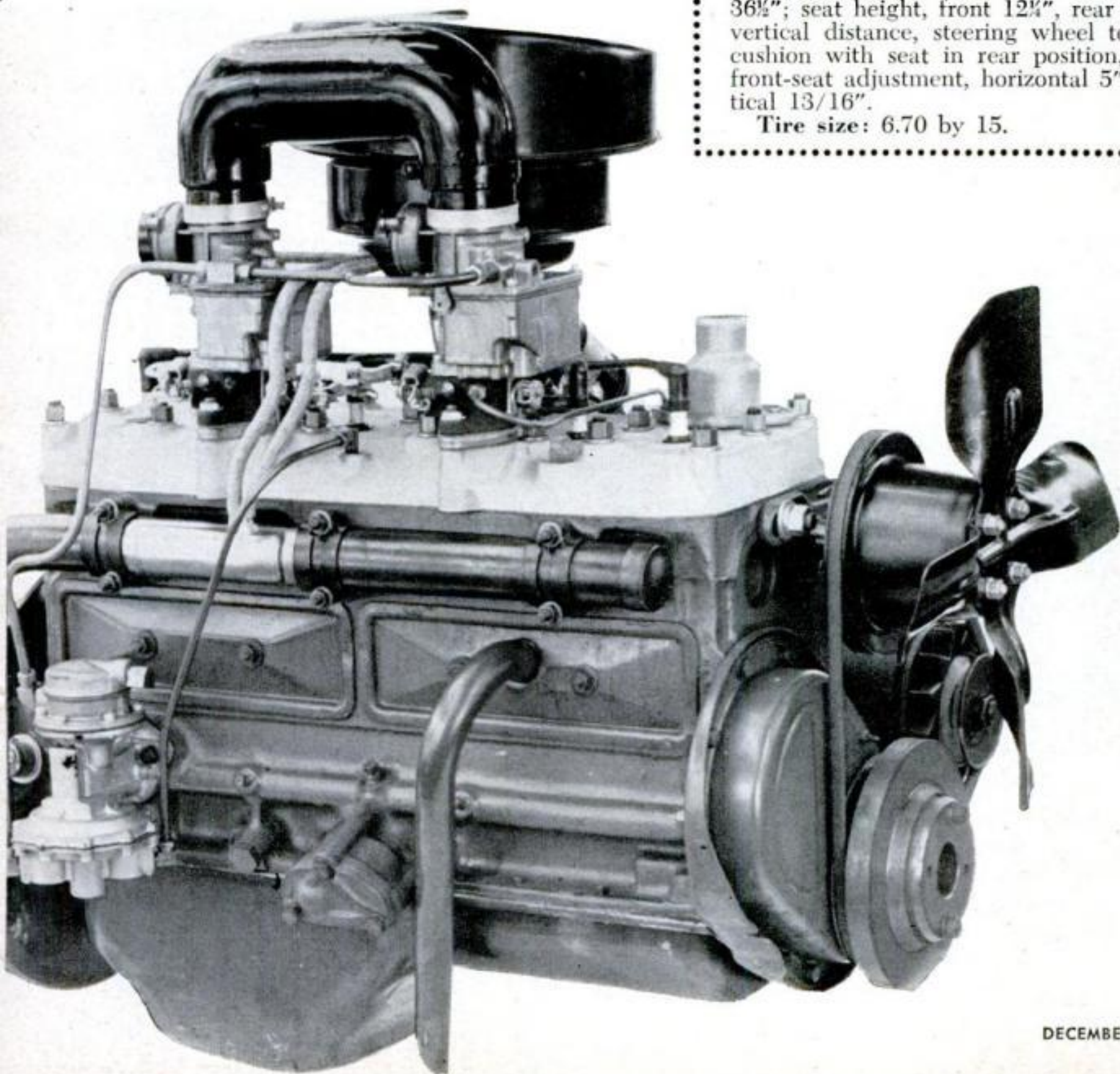
Effective brake-lining area: 149.2 sq. in.

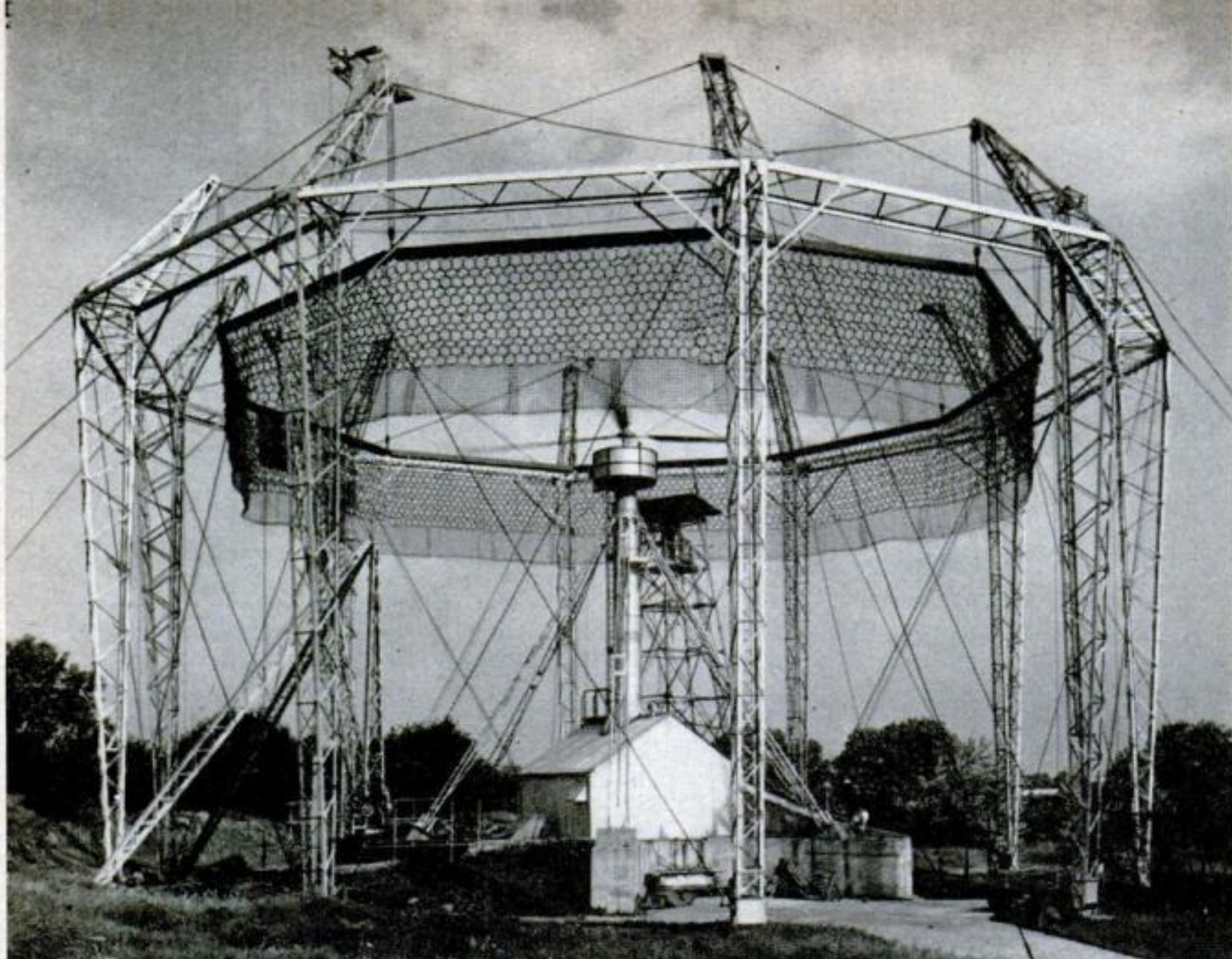
Springs: coil, front and rear.

Outside dimensions: height, 61¼"; over-all length with bumpers and guards, 202¼"; width, 78"; wheelbase, 114¼"; overhang, front 34 15/16", rear 53 1/16"; tread, front 55½", rear 59 11/16".

Inside dimensions: seat-cushion width, front 65", rear 64½"; leg room, front 41½", rear 39"; headroom, front 37", rear 36½"; seat height, front 12¼", rear 13¾"; vertical distance, steering wheel to seat cushion with seat in rear position, 6¾"; front-seat adjustment, horizontal 5", vertical 13/16".

Tire size: 6.70 by 15.

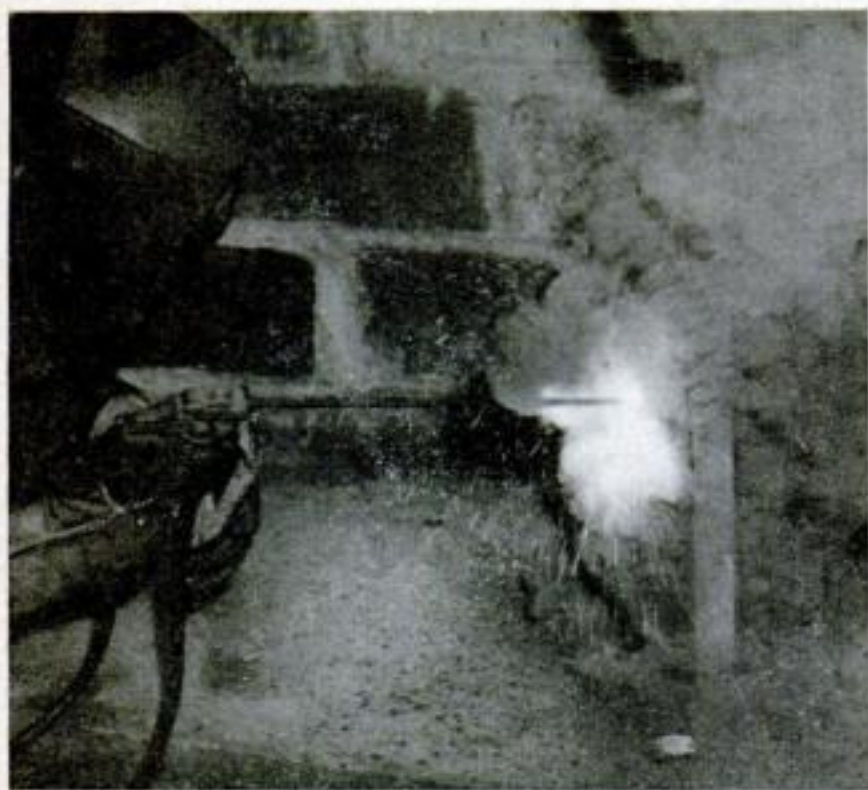




Helicopter Blades Go for a Test Whirl on "Merry-Go-Round"

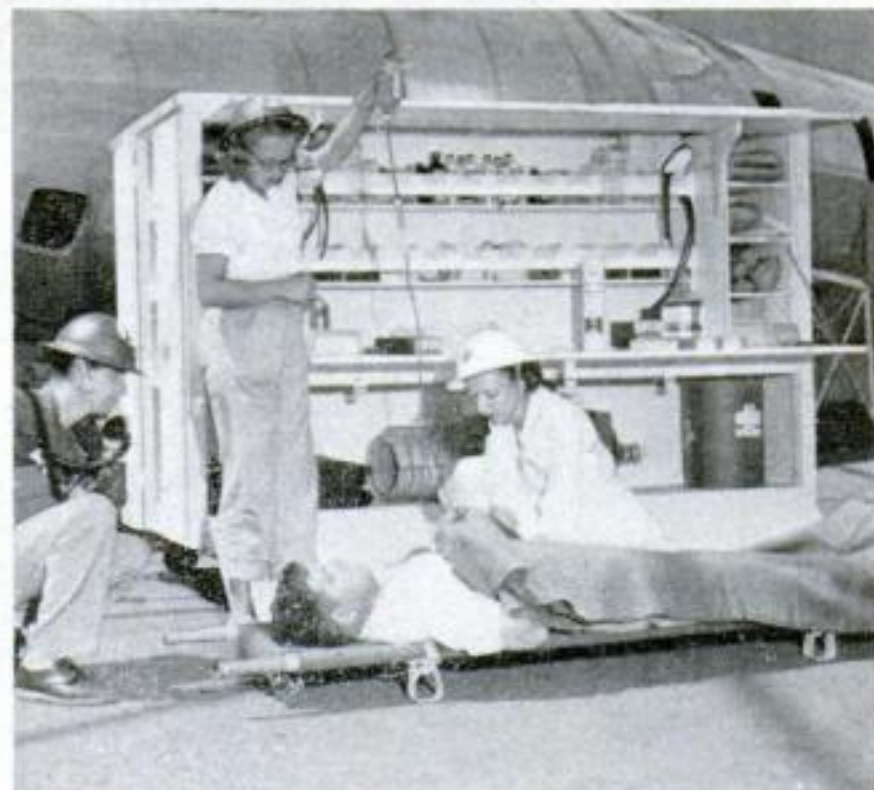
SPUN by a 700-horsepower electric motor, rotor blades for Britain's Bristol helicopters get strength and flutter tests on the odd-

looking structure pictured above. Rotors up to 70 feet in diameter are given a dizzy whirl on the center tower.



Torch Burns Holes in Concrete

SHOOTING a flame of 8,000 degrees F., the cutting rod above, called DynaTrode, burns in mid-air with no ground connections. It eats into concrete an inch a minute. It is used with DC welding machines but its cables feed through rod to tip, where arc is created. Eutectic Welding Alloys Corp., Flushing, N.Y., makes it.

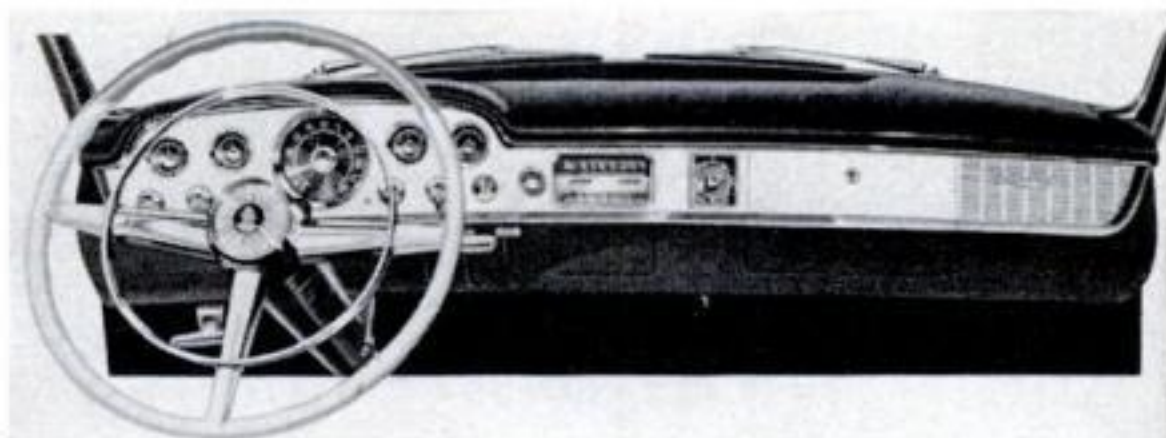


First-Aiders Roll to Rescue

WHEN an accident occurs in the Convair plant at San Diego, the first-aid station can be rolled to the spot. It's a huge chest mounted on four wheels, and it contains everything essential for emergency treatment, from iodine to plasma. Above, one mobile unit is shown in action during a recent civil-defense drill.



De Soto Ups Horsepower for 1954



INSTRUMENT PANEL, closer to driver, has separate dials. Radio speaker is at far right, glove compartment to its left.

TEN horsepower and a high-performance transmission have been added to the 1954 De Soto V-8 to give the car more snap when the light turns green.

A little longer and wider, the De Soto now extracts 170 hp. from its hemispherical-head cylinders. Compression ratio has been boosted from 7.1:1 to 7.5. The optional

automatic transmission boasts the highest over-all torque multiplication in the industry—4.47:1.

Like other cars in the Chrysler Corp. line for '54, the De Soto has a new front suspension to cut down body roll on turns. The company continues to offer the 116-hp. six-cylinder engine in five models.

FACTS ON '54 DE SOTO

Model: convertible.

Engine: V-8 with overhead lateral valves; 170 hp. at 4,400 r.p.m.; compression ratio, 7.5:1; piston displacement, 276.1 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,410; bore and stroke, 3 $\frac{3}{8}$ " by 3 $\frac{11}{32}$ "; crankshaft bearing surface, 43.8 sq. in.; torque, 255 lb.-ft. at 2,000 r.p.m.

Weight: 4,170 lb.; per hp., 24.5 lb.

Transmission: PowerFlite automatic (torque converter); rear-axle ratio, 3.54:1.

Steering ratio: 16.2:1 (25.8 without power steering); radius of turning circle, 20', 9 $\frac{1}{2}$ ".

Effective brake-lining area: 201 sq. in.

Springs: front, coil; rear, semi-elliptic.

Outside dimensions: height (to top of windshield), 59 $\frac{3}{16}$ "; over-all length with bumpers and guards, 214 $\frac{1}{2}$ "; width, 77 $\frac{3}{4}$ "; wheelbase, 125 $\frac{1}{2}$ "; overhang, front 37", rear 52"; tread, front 56 $\frac{5}{16}$ ", rear 59 $\frac{3}{4}$ ".

Inside dimensions: seat-cushion width, front 61 $\frac{1}{2}$ ", rear 60 $\frac{1}{2}$ "; leg room, front 44", rear 41 $\frac{1}{2}$ "; seat height, front 14 $\frac{3}{4}$ ", rear 14 $\frac{1}{4}$ "; vertical distance, steering wheel to seat cushion, with seat in mid-position, 5 $\frac{3}{4}$ "; front-seat adjustment, horizontal, 5", vertical 1 $\frac{1}{8}$ ".





Tire size: 7.60 by 15.

P.S.

Last minute news & notes...

MORE OF THE LONG, LEAN EUROPEAN LOOK may be in store for U.S. cars, rumors Detroit. Surprisingly, the new contour is expected from the most conservative (in styling) of the Big Three. Chrysler Corp.'s new boss stylist is Virgil M. Exner, the man responsible for the '46 Studebaker. He says, "For 1955, it's . . . a more slender car." . . . The H-bomb isn't forgotten by Plymouth engineers. They will mark their '54 car radios with the Conelrad frequencies to which all stations will switch in the event of air attack. . . . Spare gasoline engines are being installed in some German trolley buses: they let the motorman leave the wire line temporarily to get out of a traffic snarl.

INDIA'S MOVIE INDUSTRY RANKS SECOND only to the U.S. in feature-film production, statistics from the United Nations reveal (see chart). Italy, source of many of the most famous postwar movies, is way down in seventh place in quantity.

WHO MAKES THE MOST MOVIES?	
COUNTRY	EACH SYMBOL REPRESENTS 200 LONG FILMS
UNITED STATES	
INDIA	
JAPAN	
UNITED KINGDOM	

CHEAPER COLOR TELEVISION is promised for both viewer and broadcaster by newly developed equipment. Columbia Broadcasting System has unveiled a new color viewing tube much simpler in construction than RCA's (PSM Nov. '53, pp. 122-3). At the first

press demonstration, however, the color picture produced on it was disappointing. For broadcasters, CBS showed how small, relatively cheap rotating-disk cameras could be used in the studios, their signals being converted in the control room to the NTSC color system. . . . An apparent record for long-distance TV reception has been set by a London fan, Charles W. Batley, who picked up Oklahoma City's WKY-TV.

WATCH YOUR AIM if you use one of those new tools employing blank cartridges to drive wall fasteners. One carpenter didn't, California police report. His nails missed the studding, went through the wall, killed a man who was working in an adjoining room.

VACCINES against two dreaded plagues --polio and TB--are closer to reality. The National Foundation for Infantile Paralysis will spend \$7,500,000 next year on production and test of the new polio vaccine. Gamma globulin--\$19,000,000 worth --will also be used pending completion of the vaccine trials. The tuberculosis preventive was developed at the University of Michigan, has been tried successfully on animals but not on people . . . Antibiotic ice--flake ice containing a minute quantity of aureomycin--keeps fish fresh longer, report Canadian experimenters . . . And milk will stay sweeter longer if the cows are fed a little of a chemical called menadione, according to scientists at Florida State University.

WOMEN DRIVERS may deserve some of the things men say about them, concludes a New York University researcher who checked speeders by radar last summer. He found that 53 percent of all speeders he clocked were women, but reports that nearly everybody broke the traffic laws--even in front of a state-police barracks . . . A whole town in Long Island may be "punctureproof," for a while anyway. The Rubberseal Corp. plans to test its self-sealing tire compound by treating--free--every tire in the community . . . A new cold-weather oil promises easier starting even on 30-below mornings. Gulf claims its product won't evaporate as readily as other light oils.

You Can Use Aluminum Like Wood

Even the man who never worked with metals before can now make many useful projects.

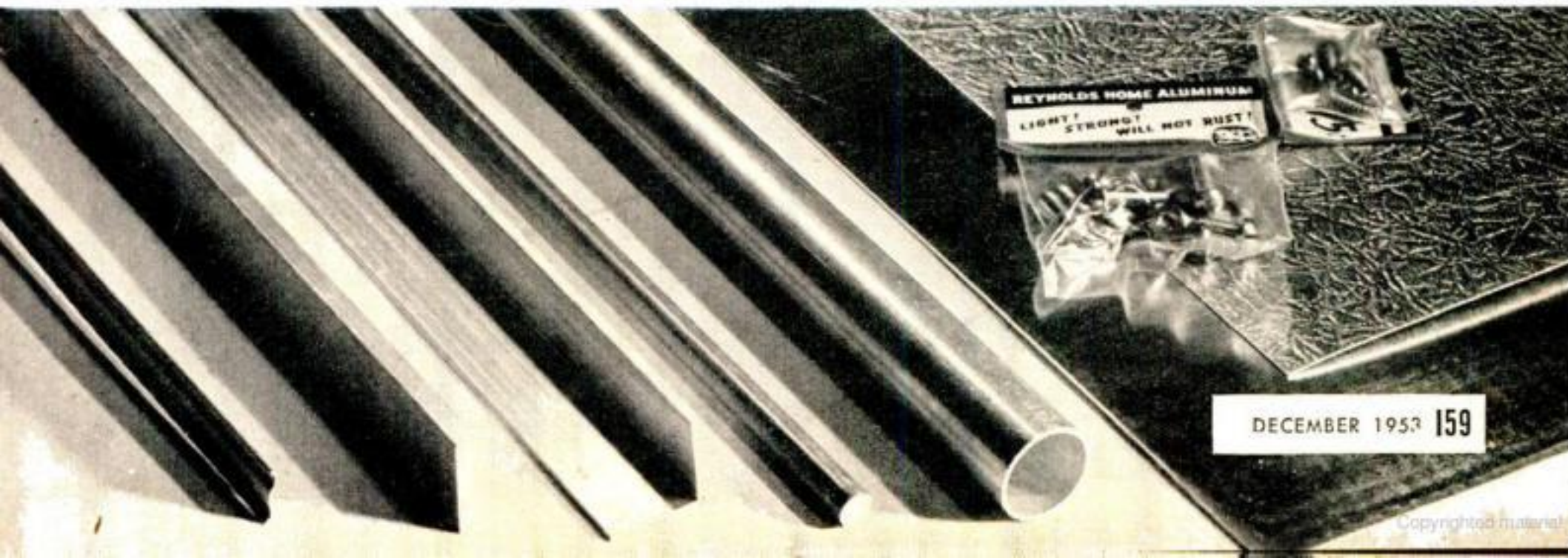
**By Herb Pfister
and Harry Walton**

IF YOU think material other than wood is not for you, if you believe metal projects are beyond your skill, take a look at the shiny stock shown here. It's metal with a difference—handsome, strong and as easy to use as clear pine.

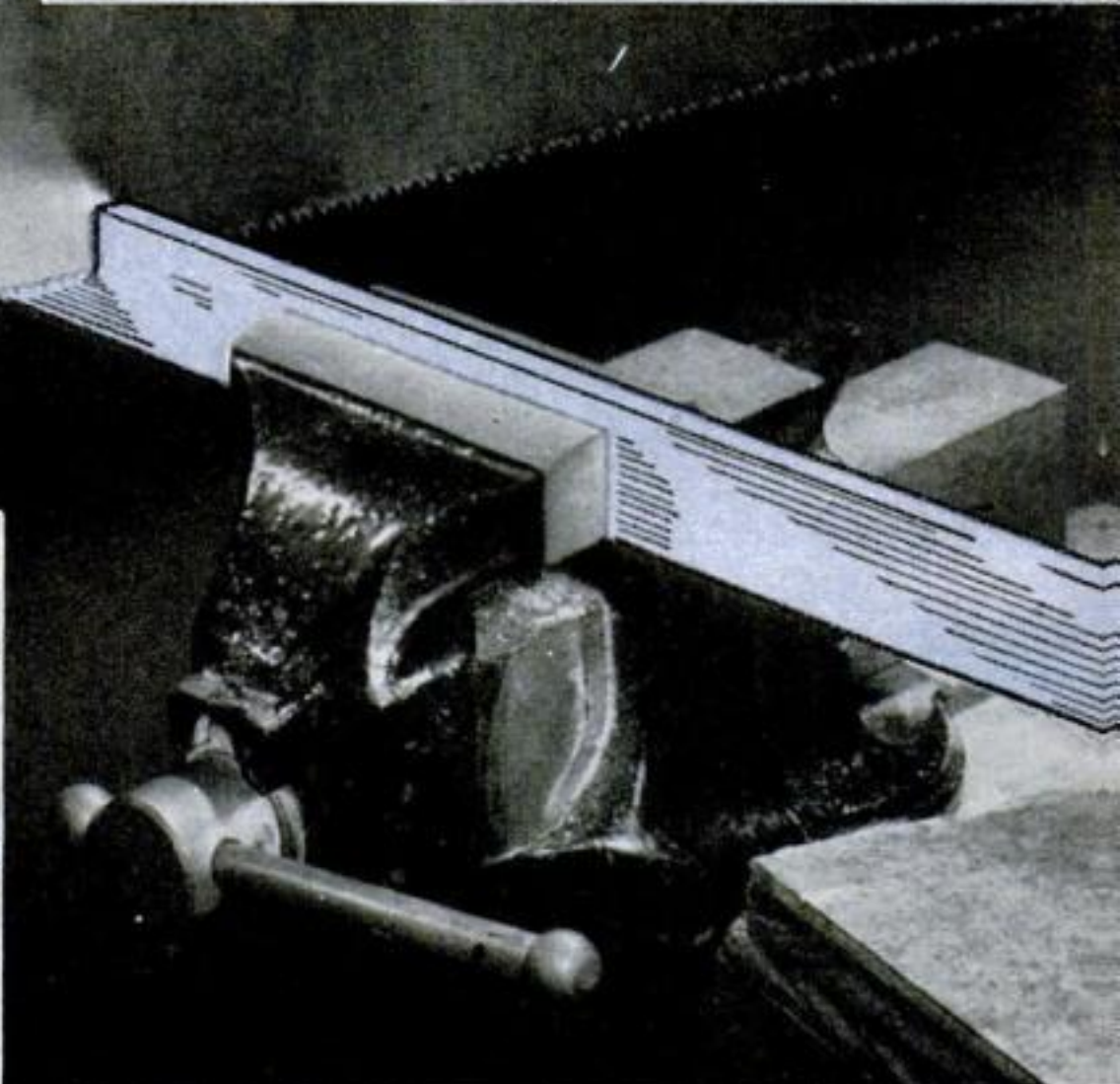
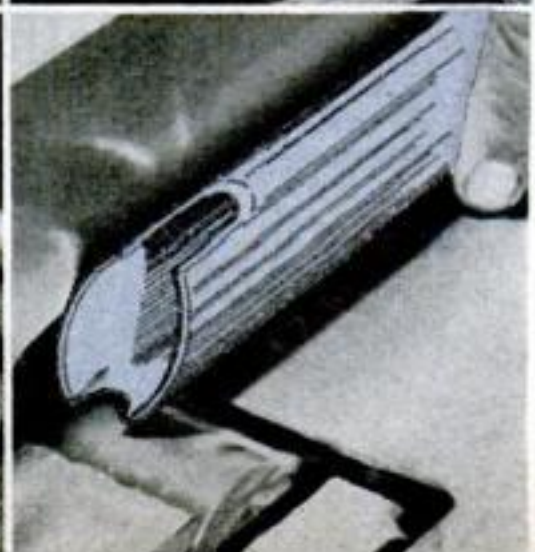
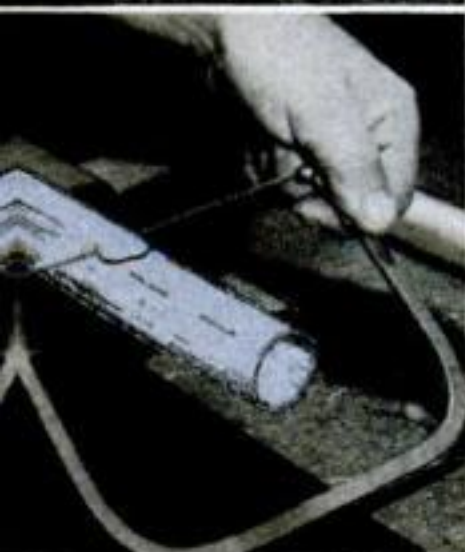
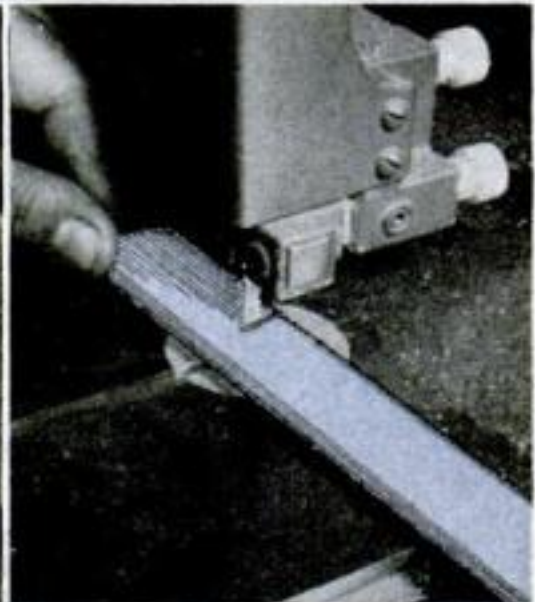
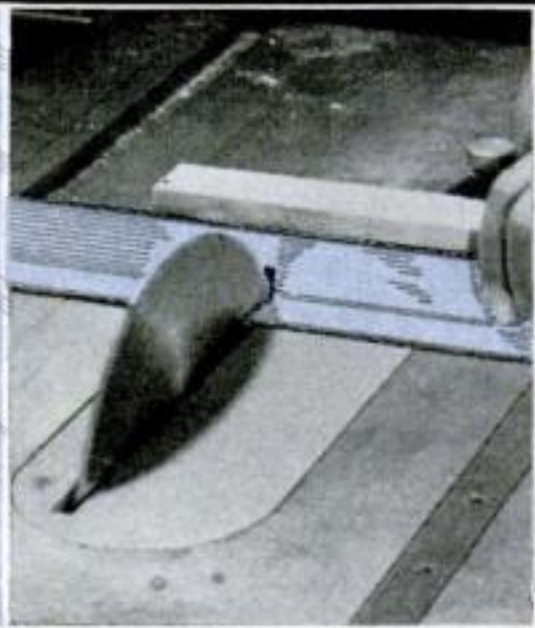
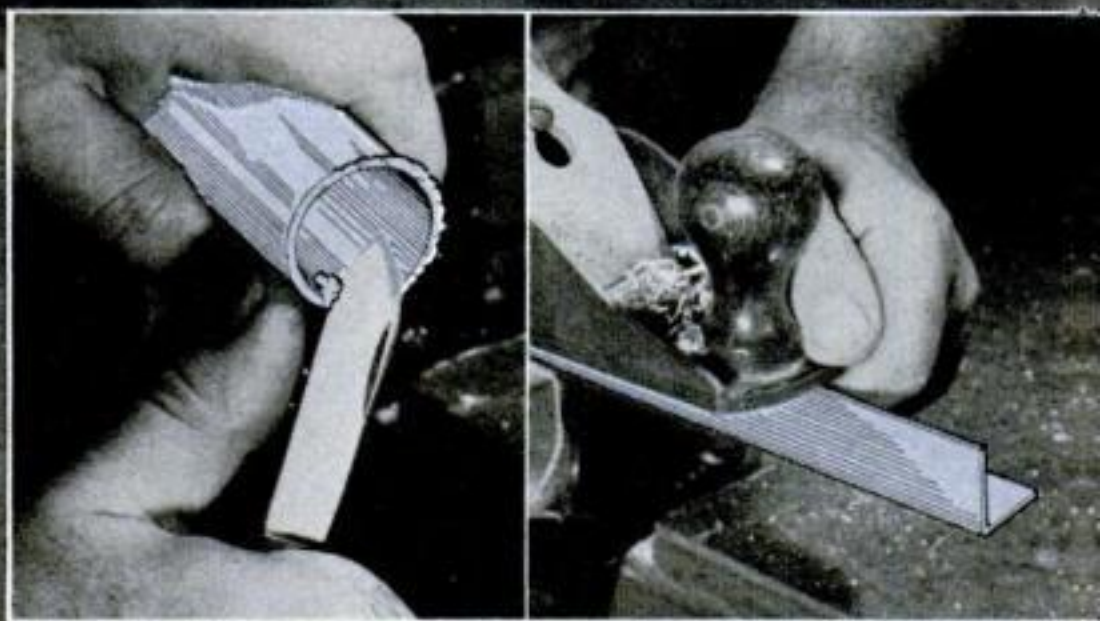
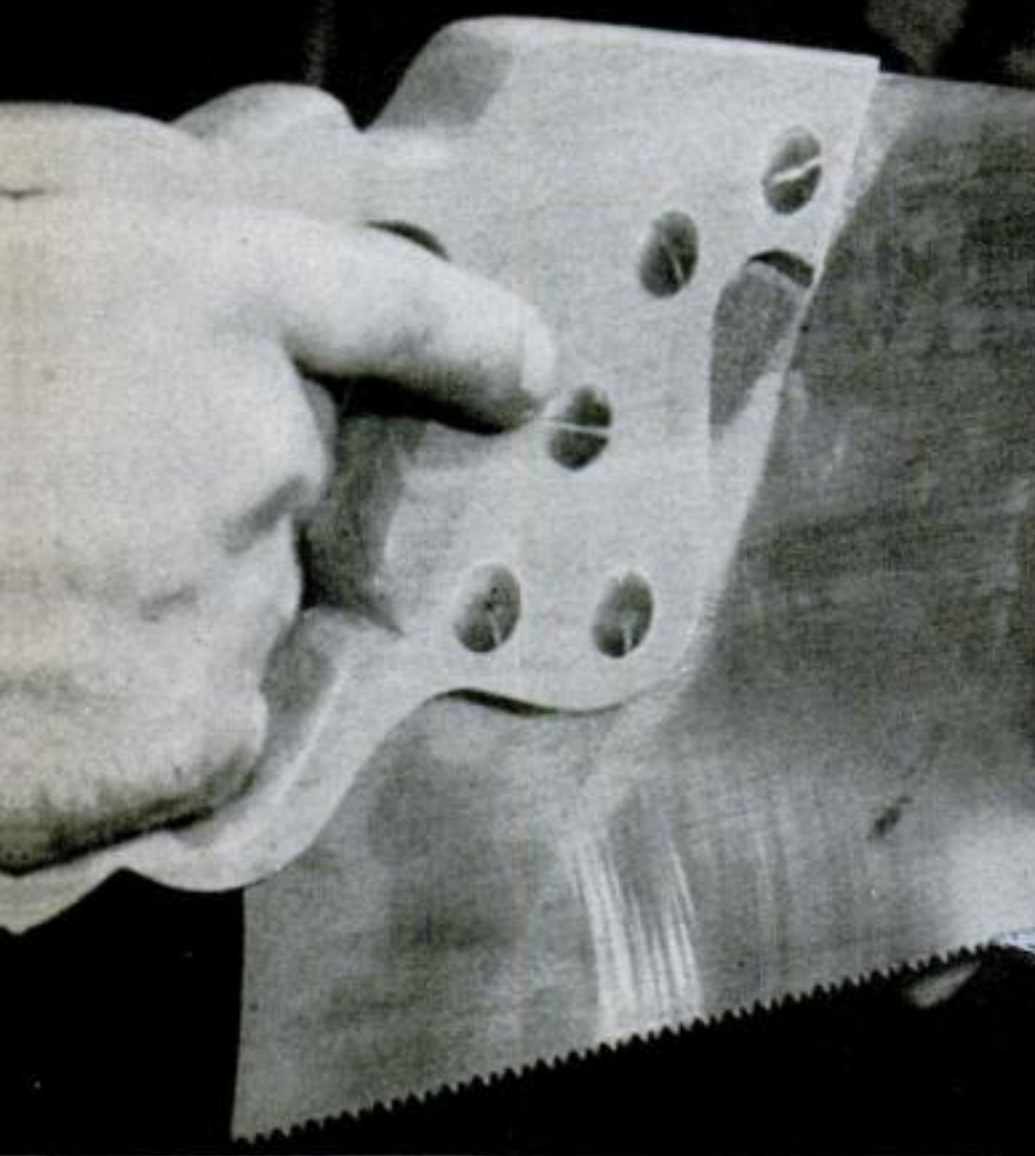
It's "do-it-yourself" aluminum, especially made for the householder and home mechanic. You cut, smooth, bore and shape it with the tools you already have—common, everyday woodworking tools.

It won't damage tools. Saw it with your pet crosscut saw. Plane it like wood. Bore it with your best auger bit. Let a

ALUMINUM STOCK that you'll find at hardware stores includes tubing, bar, angle, rod, sheet, decorative molding and special moldings for storm windows and screens. The sheet, in 3'-by-3' squares, comes both plain and embossed to simulate leather. Long stock, in 5', 6', 7' and 8' lengths, includes these sizes: tubing, $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ "; bar, $\frac{1}{8}$ " by $\frac{3}{4}$ ", $\frac{1}{4}$ " by 1"; angle, 1" by 1"; rod, $\frac{3}{8}$ ". You'll also find aluminum screws and rivets.



Any Tool That Cuts Wood Cuts This Aluminum



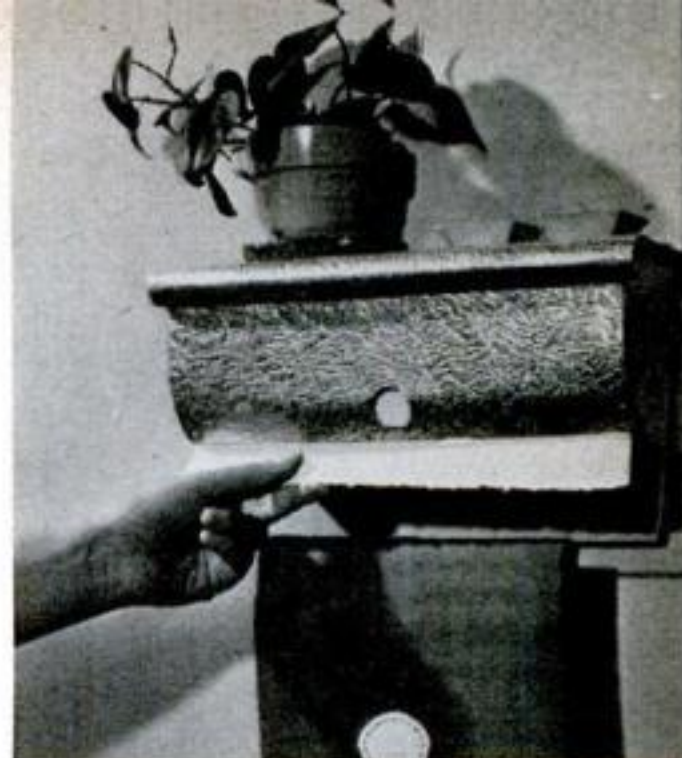
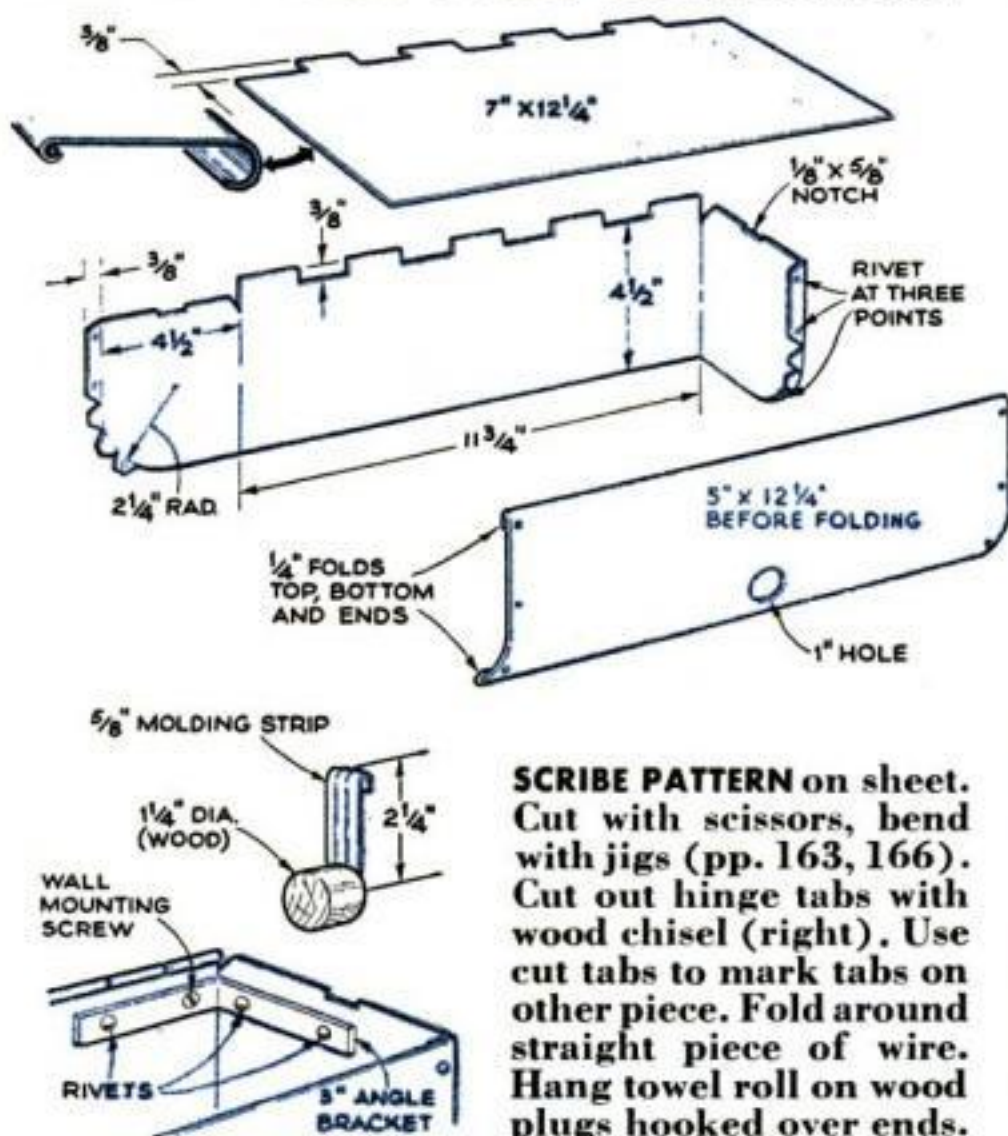
circular saw sweep through it. Use a power jointer to straighten an edge or cut a flat through tubing. The tools will still have their original sharpness.

Finishing is no problem. The aluminum takes lacquer, paint or enamel beautifully, although it already has a permanent, non-rusting surface that you can buff as bright as silver or sand or wire-brush to a satin sheen.

At your hardware store. Right about now this aluminum, produced by the Reynolds Metals Co., should be appearing in your neighborhood hardware store in various shapes and sizes. You'll find two shapes designed for special jobs—a molding for making your own aluminum storm windows easily and economically, and a rolled shape for making window screens. Aluminum

You Can Build Towel Holder

Embossed-sheet box holds paper roll, and bar below is for cloth towels.



rivets, self-tapping screws and machine screws for assembling your projects also will be available—in plastic bags.

Working tips. Although the metal does no harm to a circular-saw blade, bits of aluminum adhering to the teeth give a fuzzy finish to wood that is cut later. These bits can be cleaned off by rubbing a cloth on each side of the blade in the direction of the teeth points. Feed the metal slowly into power tools to prevent overheating and give chips a chance to clear. A piece of scrap wood placed over work being cut will minimize flying chips. Otherwise eye-protecting goggles are a good idea. But don't be carried away and try to cut just any aluminum alloy you happen to have with woodworking tools. It may be harder and damage the cutting edge.

Joining and fastening. Sheet aluminum crimped with a wooden jig can be interlocked along the edges for a permanent joint. Holes can be punched in moldings and sheet with a nail.

Aluminum is notoriously hard to solder, but some special soldering alloys come in

handy for small projects. One fluxless solder^o is simply rubbed on after the aluminum is brought up to 600° with a small gas torch. The coating that results forms a base for making ordinary solder stick, or the alloy itself can be used to make the joint.

To try out this aluminum, POPULAR SCIENCE MONTHLY built a variety of projects. Notes on these follow.

Towel holder (above). The back and ends are bent from one piece. To form hinge tabs, chisel out between scissor slits. Roll the front after making $\frac{1}{4}$ " folds on all sides. Join the folded edges and ends of the housing with aluminum rivets. Reinforce the holder by riveting a 3" iron angle bracket inside each rear corner.

Luggage rack (see page 162). The frame was made 3' square to get the most out of 6' lengths of angle. It is reinforced by an aluminum bar at each end, the bar protruding 4" on each side. Bent down to the roof contour, these protruding ends take the suction cups and drip-molding straps.

When bending the tubing, pack sand

^oCHEMALLOY, Sightmaster Corp., New Rochelle, N.Y.

inside to prevent kinking. The first bend must be correct. You can't straighten and bend it again.

Storm sash (see page 164). Aluminum screen bent over a thin wire frame can be used to replace the lower pane of glass, giving you an effective sash for both winter and summer. But to do this, you'll have to take the frame apart to substitute the screen for the glass.

Although cutting the miters with a bench saw is faster and assures more accuracy, you can do the job with a handsaw by working carefully.

Fireplace screen (see page 165). Since the panel area is larger than six sq. ft. (which calls for a cross brace in a window screen), take special pains to stretch the

wire or hold it flat with weights while driving in the plastic spline.

Modern railing (see page 166). Cement poured into 1" tubing gives rigidity to the supporting posts. Use a ready mix or mix one part cement to two of sand.

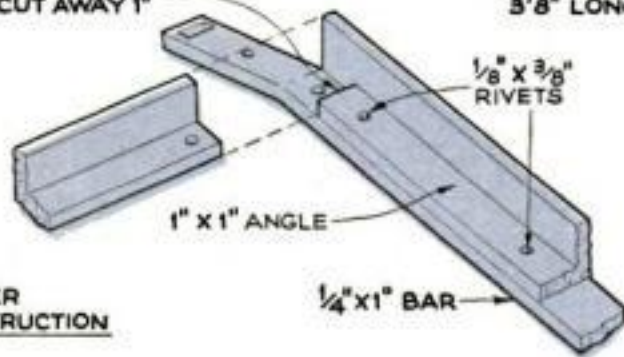
Holes can be made in concrete steps for the supporting posts by using a star drill or carbide-tipped masonry drill to make a series of small holes around a 1½" circle. Chip out the concrete inside the circle with a cold chisel and hammer.

Hardwood dowels forced into the ends of the tubing make assembly a wood-screw job. Uniform bevels on the ends of tubing over the steps can be cut on a bench saw, using the miter head set to the proper angle.

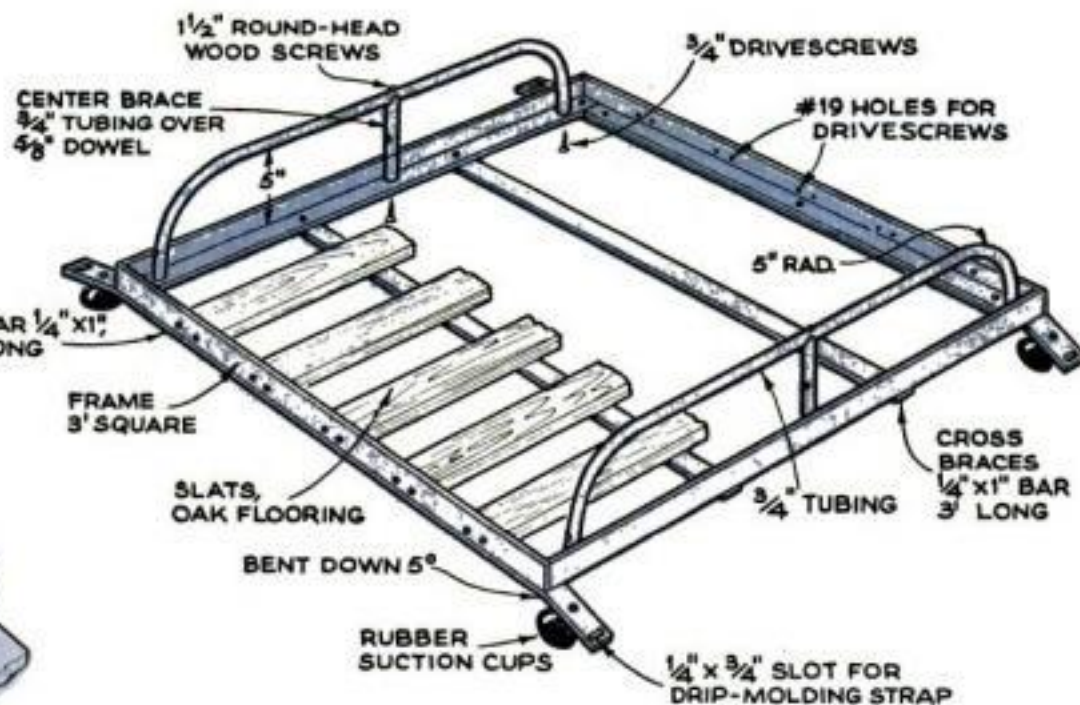
Aluminum Car Rack Lightens the Load

Using tubing, angle and bar stock, you'll find this luggage carrier easy to build.

LOWER LEG OF END ANGLE CUT AWAY 1"

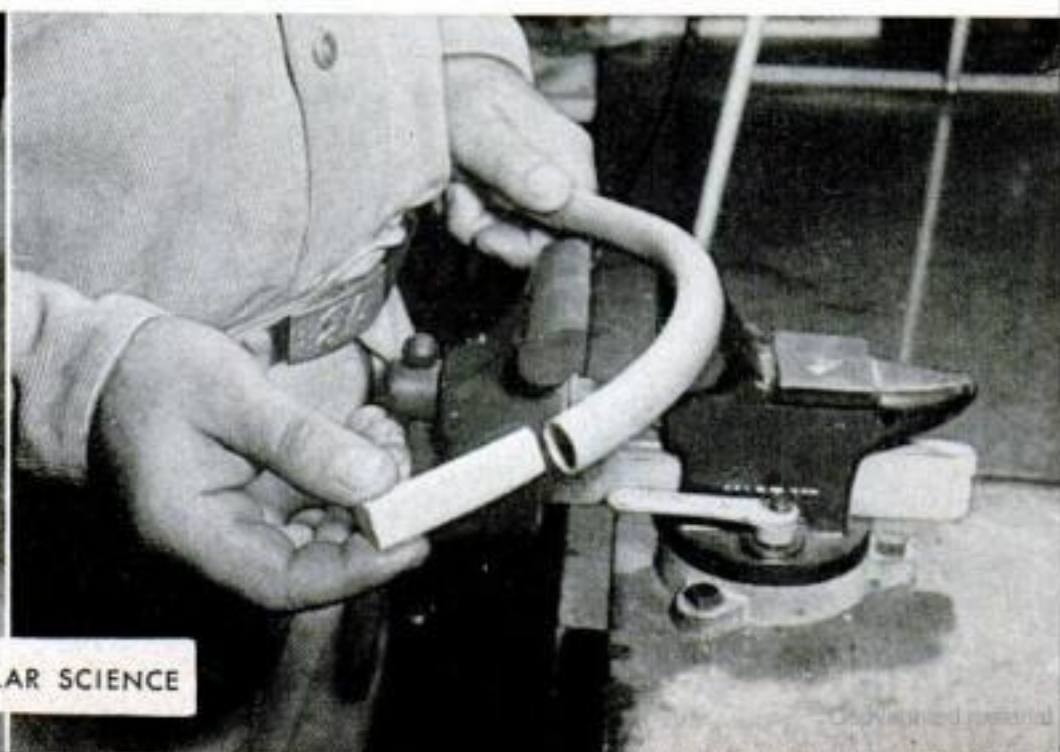


CORNER CONSTRUCTION



1 TO FORM SIDE RAILS, bend sand-filled tubing around end of board cut to 5" radius. Wood strip nailed to bench holds tubing against bending board. Use husky bolt or pipe in tubing for extra leverage, ramming it tight against sand. Plug opposite end.

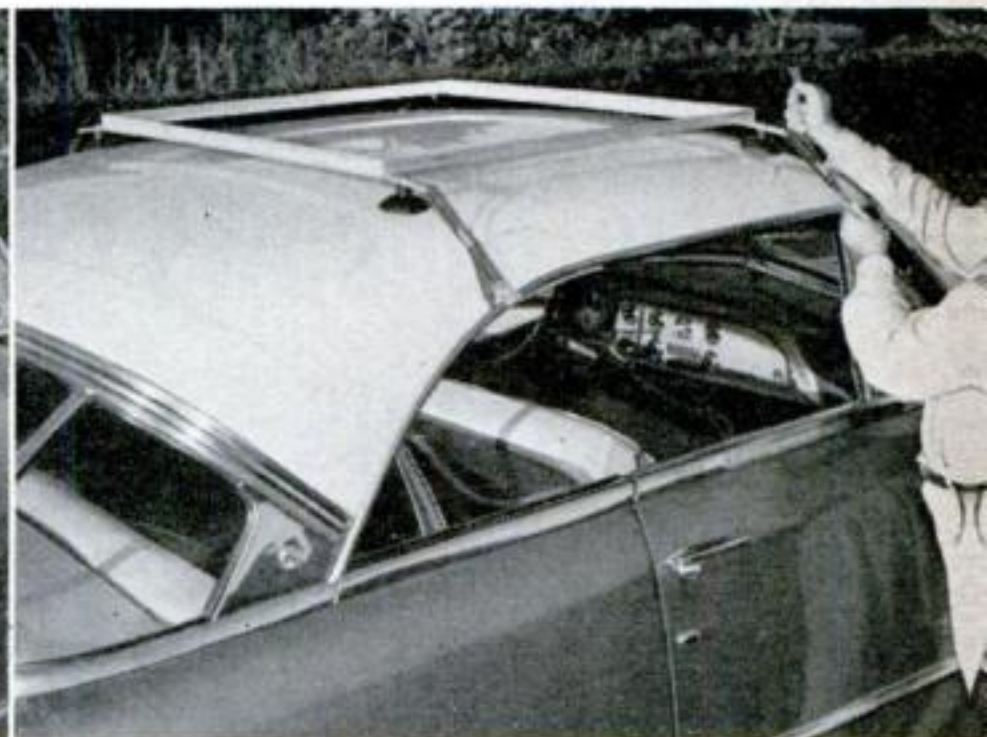
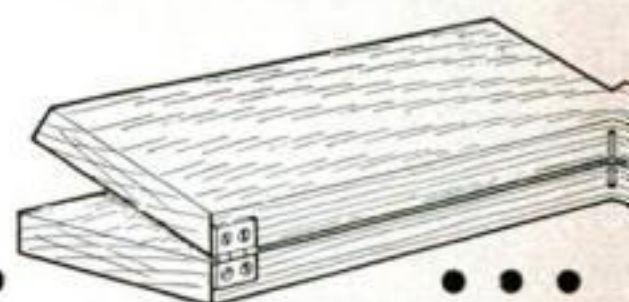
2 PLUG SIDE-RAIL ENDS with hardwood dowels after shaking out sand and cutting off excess tubing. Join rail to frame by driving screws through bottom leg of frame angle into the dowels. Small screws through side of tubing keep dowels from twisting.



Wooden Brake Bends Sheet Aluminum



HOMEMADE BENDING BRAKE consists of two pieces of hardwood hinged on one edge near ends. Bevel hinged edge of one as in sketch. Clamp pieces together with cardboard between and screw on hinges. To use, slide in sheet aluminum until bend line lies along hinged edge. Place on wood block narrower than hinge spacing (left above), hold fast and fold over. Brake can be opened to remove bent stock (right above).

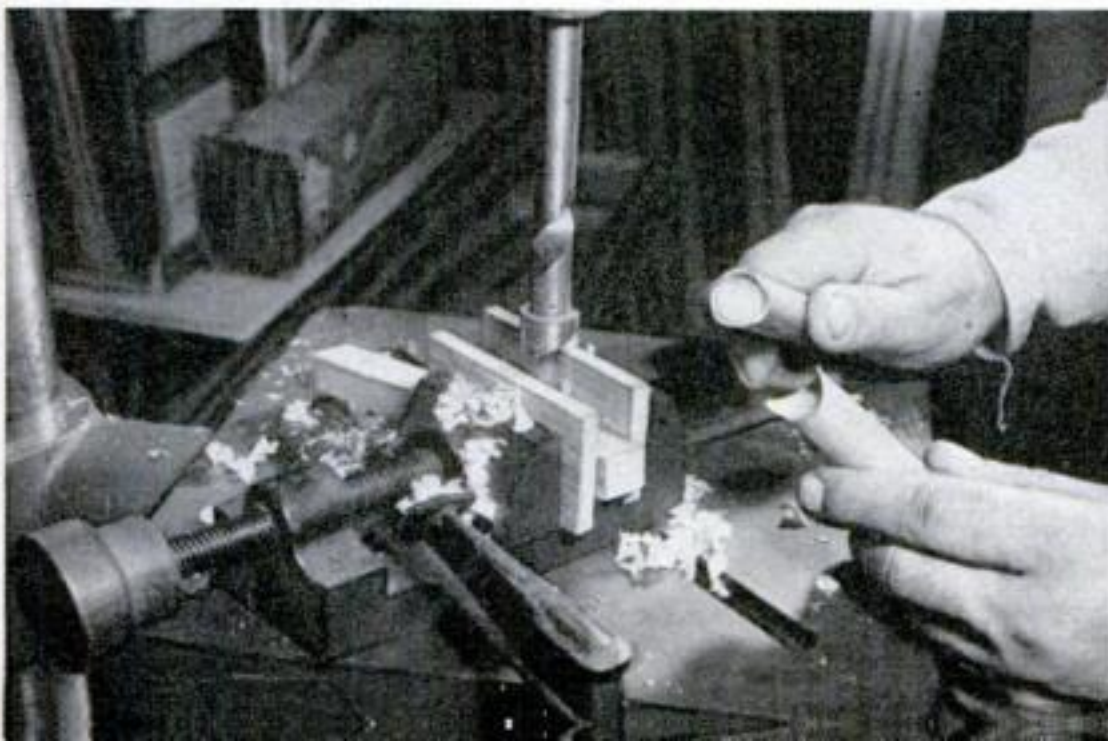


ROOF-HUGGING AND STURDY, rack can be installed in less than a minute after you have finished it. Suction cups and straps can be bought at auto-supply stores.

3 SHAPE MATING JOINT on top ends of center braces by boring through tubing with wood bit of same diameter. If you have no drill press, use rattail file to shape end. Force 5" dowel into braces to receive screws driven through rail at top and angle at bottom.

TRIAL FITTING checks frame and fit of suction cups on top. Make frame of 1"-by-1" angle and rivet it to heavier bar at each end. Rivets flatten easily between two hammers.

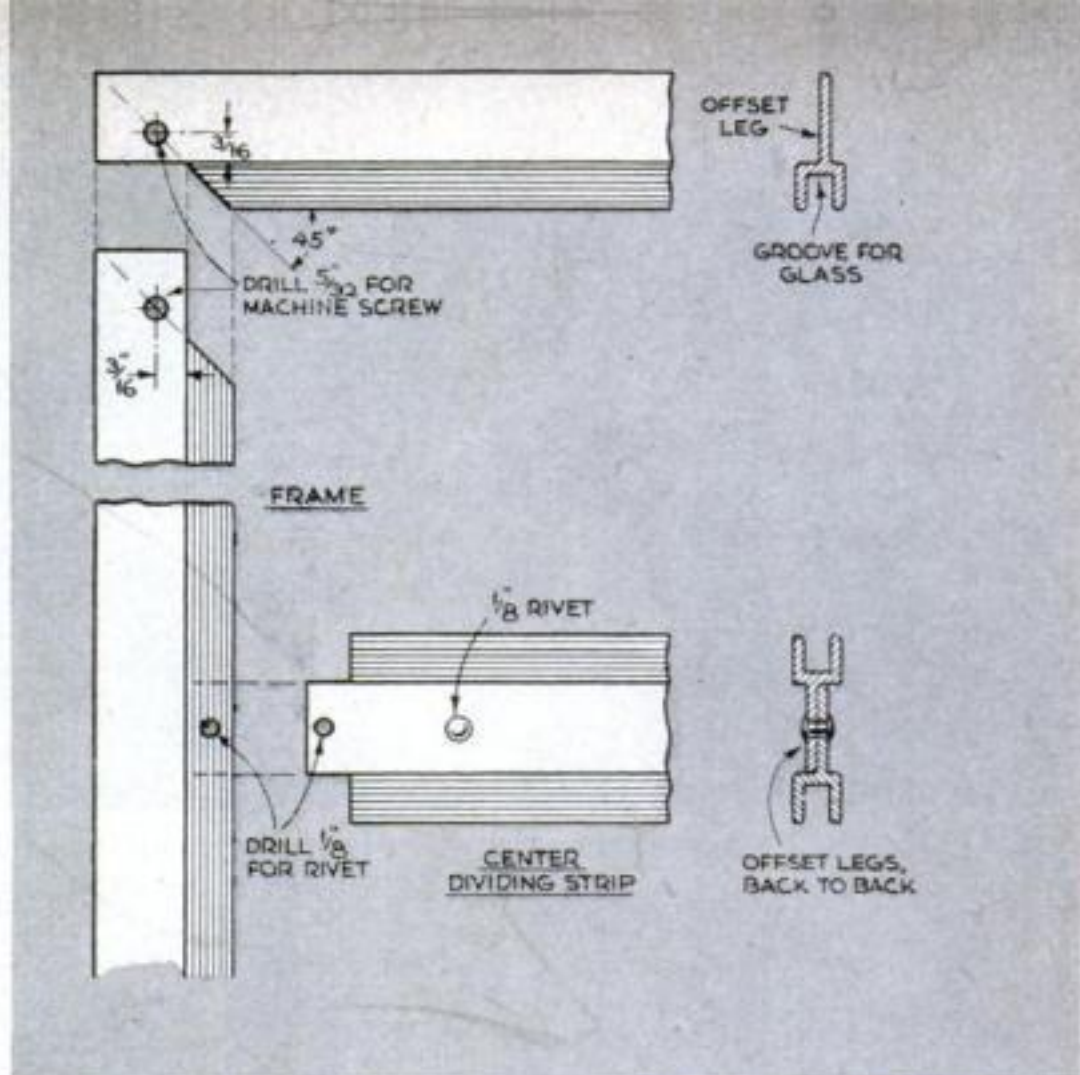
4 USE HARDWOOD SLATS, fitting them inside frame and driving two screws into each end. Oak flooring is well suited to job of supporting heavy loads. Rip tongue and groove off each piece. Turn molded side up for best appearance. Varnish for weather protection.





Fuel-saving sash are made with extruded strip that bolts together, has groove for glass.

Storm Windows and Screens

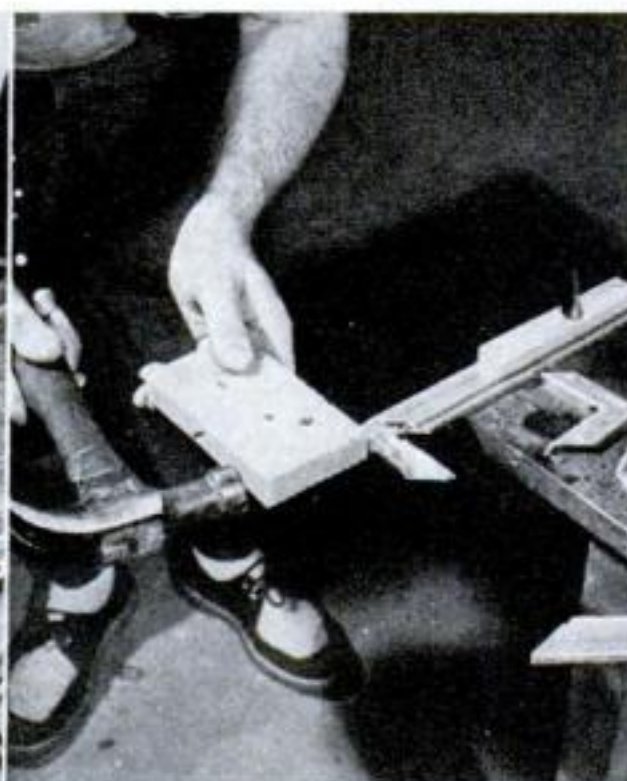


2 GROOVED BIT is cut away, leaving flat tab to be bolted or riveted to adjoining piece. Center rail is made up of two pieces, joined back to back, with grooved parts cut back.

Screen molding comes with preformed corner clips and plastic strip



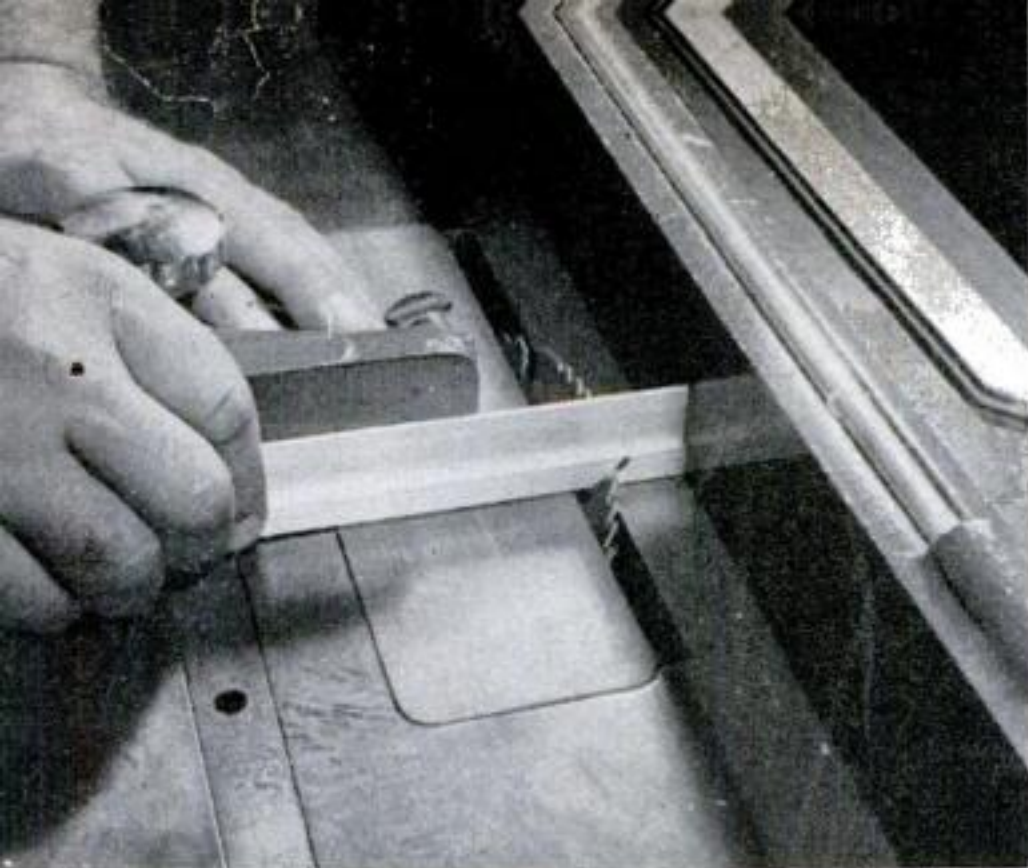
TO MAKE A SCREEN, cut special lock-strip molding to fit in window casing. Measure along edge opposite the recess and cut 45° miters. Recess must be on inside of cut, at short end of miter. Homemade miter box speeds the job.



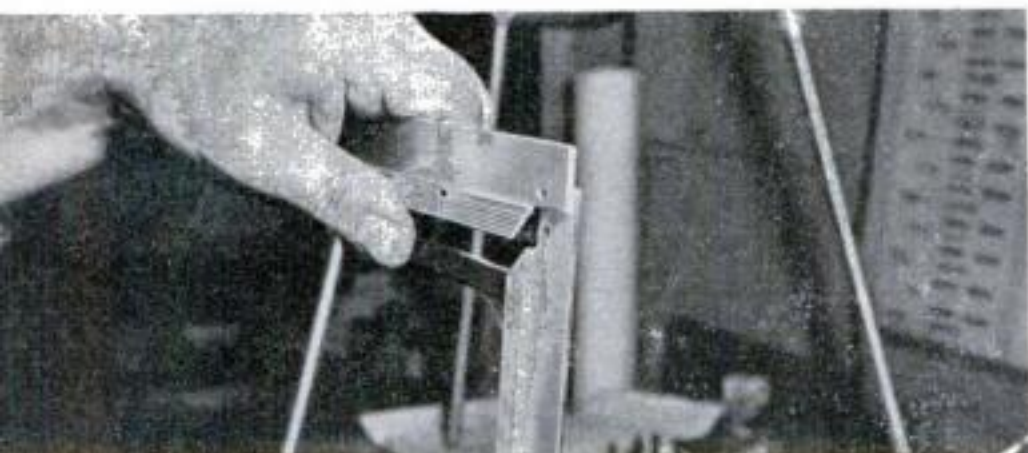
DEBURR cut ends and drive in corner clips. Clamp strip to bench top and hammer against a wood block. Join three sides, drive clips into ends of fourth, and hammer each end alternately into its adjacent side until frame comes together.



CUT SCREENING (preferably aluminum, to avoid electrolytic action) to size of frame. Snip off a corner just outside point where recesses meet. Using strip of wood that fits recess, drive screen in one side. Lay plastic welt on top.

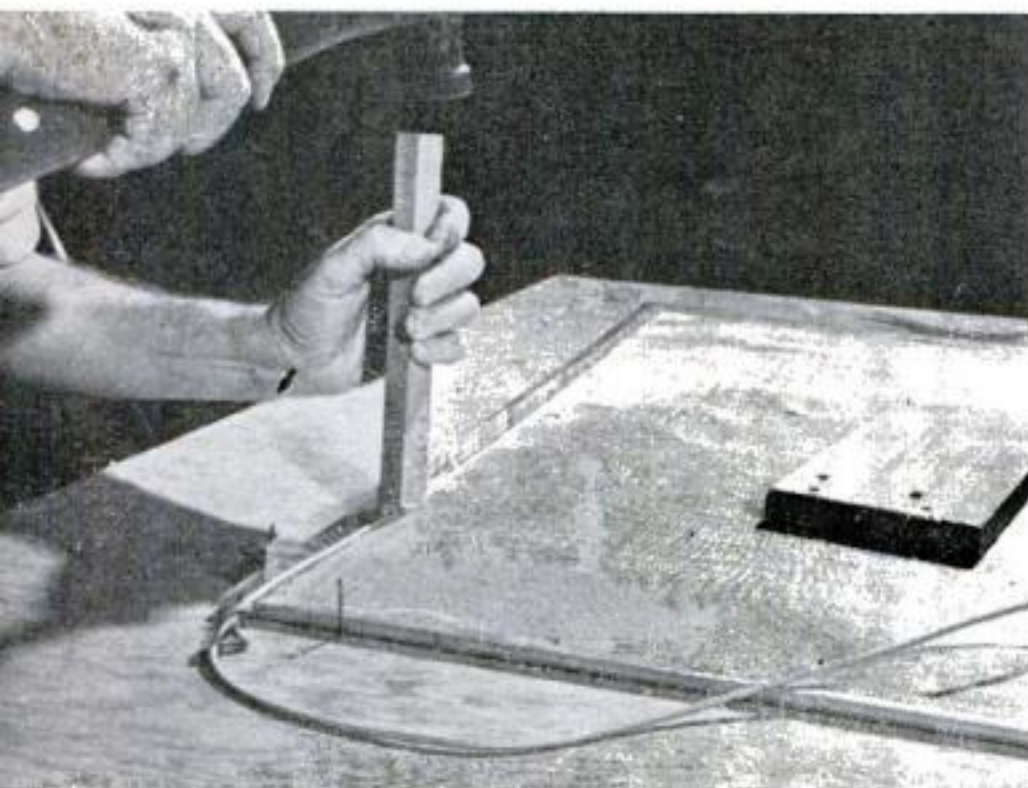


1 CUT OUTSIDE PIECES to exact length to fit a window casing. Then make a 45° miter cut through grooved section. Set saw fence as above to locate cut in relation to end.



3 ASSEMBLE AROUND GLASS, which should be double-strength grade. Bind glass edge all around with friction tape to fit groove snugly. Mount finished sash with screws or hangers.

to hold wire.

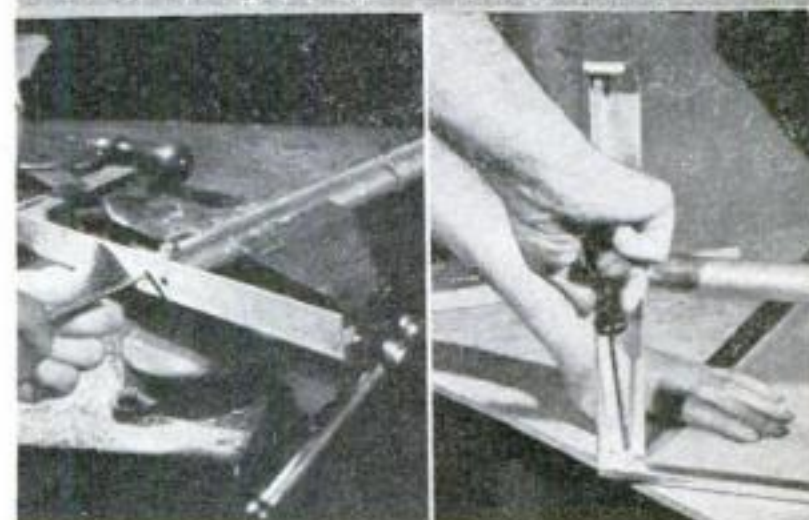
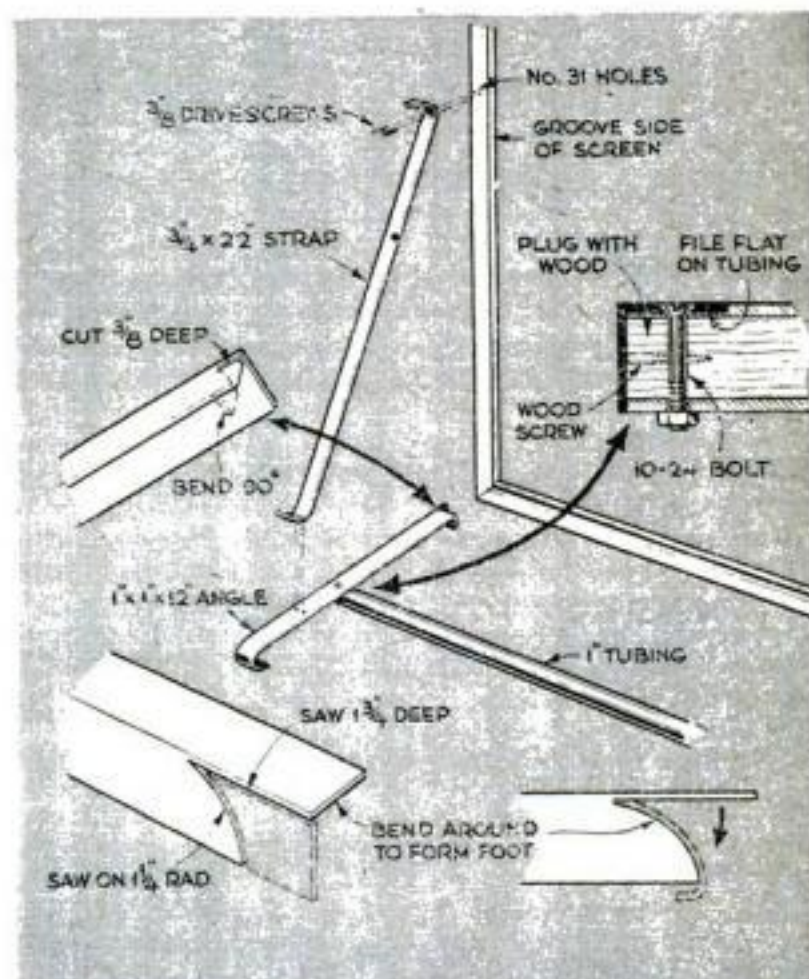


NOW HAMMER IN locking welt firmly. Clip off corner as before and continue around frame. On fourth side, put in only 6" of wire at time and follow with welt. Sharp knife cuts off surplus.



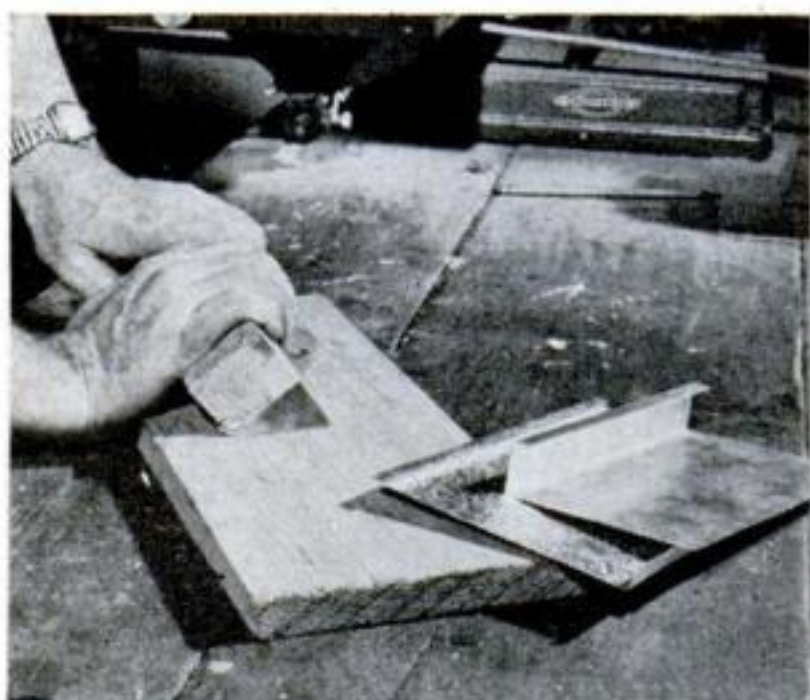
Aluminum Fire Screen

Simply add feet to panel made like window screen.



PLUG ENDS of 1" tubing with wood, file parallel flats, and bolt feet to stretcher. Two wood screws (left above) prevent twist. Attach leg with one screw into panel edge, one into face (right above). Clamp leg and frame at 90° for affixing braces.

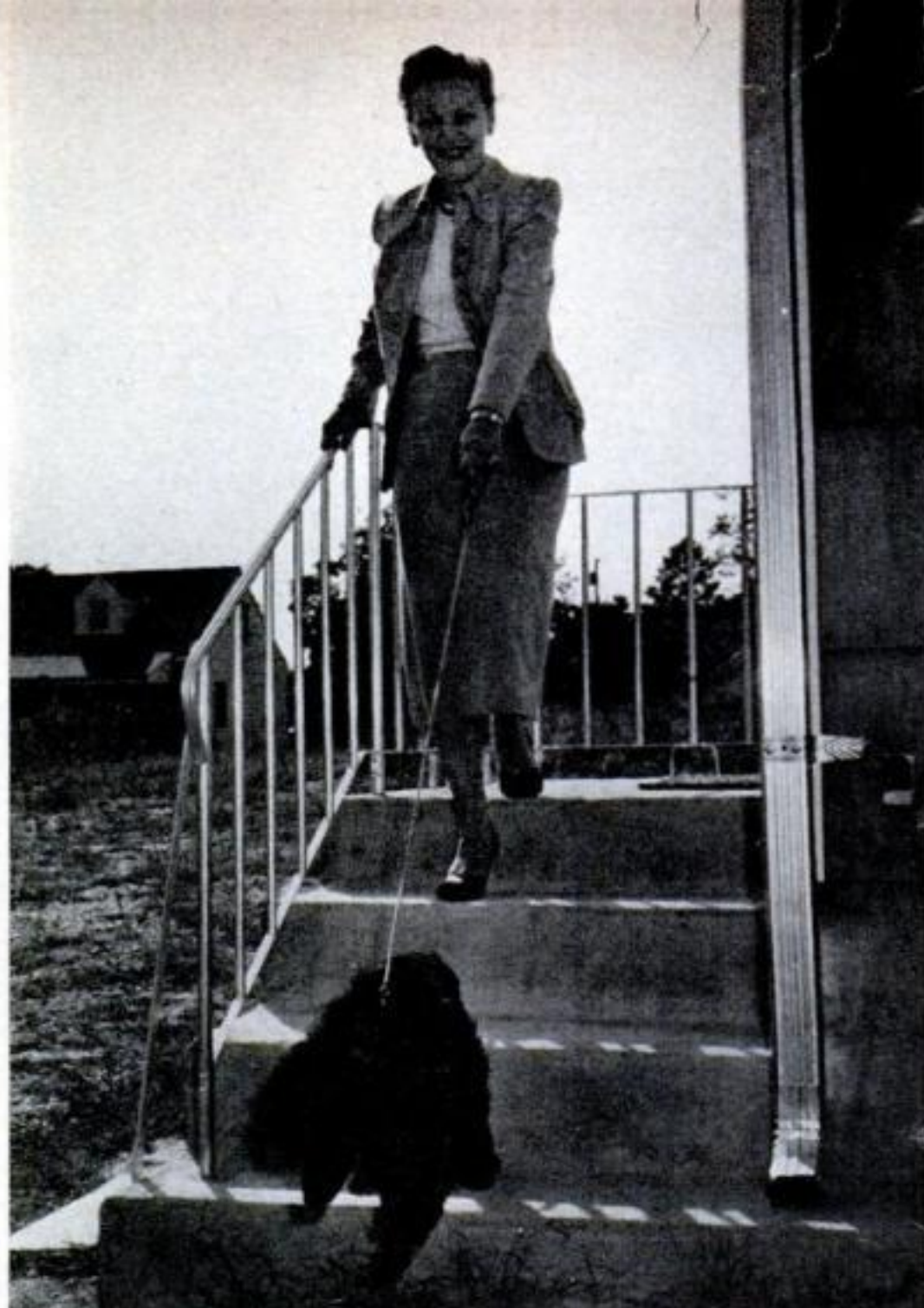
Wood Jigs Shape Edges of Sheet Aluminum



NARROW BENDS, tabs or fold-overs are easy with a piece of hardwood run over the circular saw. Kerf depth governs width of bent flange. Bevel alongside kerf as above. To use, insert stock and fold past desired angle, as metal springs back a bit. For folded edge, bend as far as possible, remove from jig, press down with flat wood.

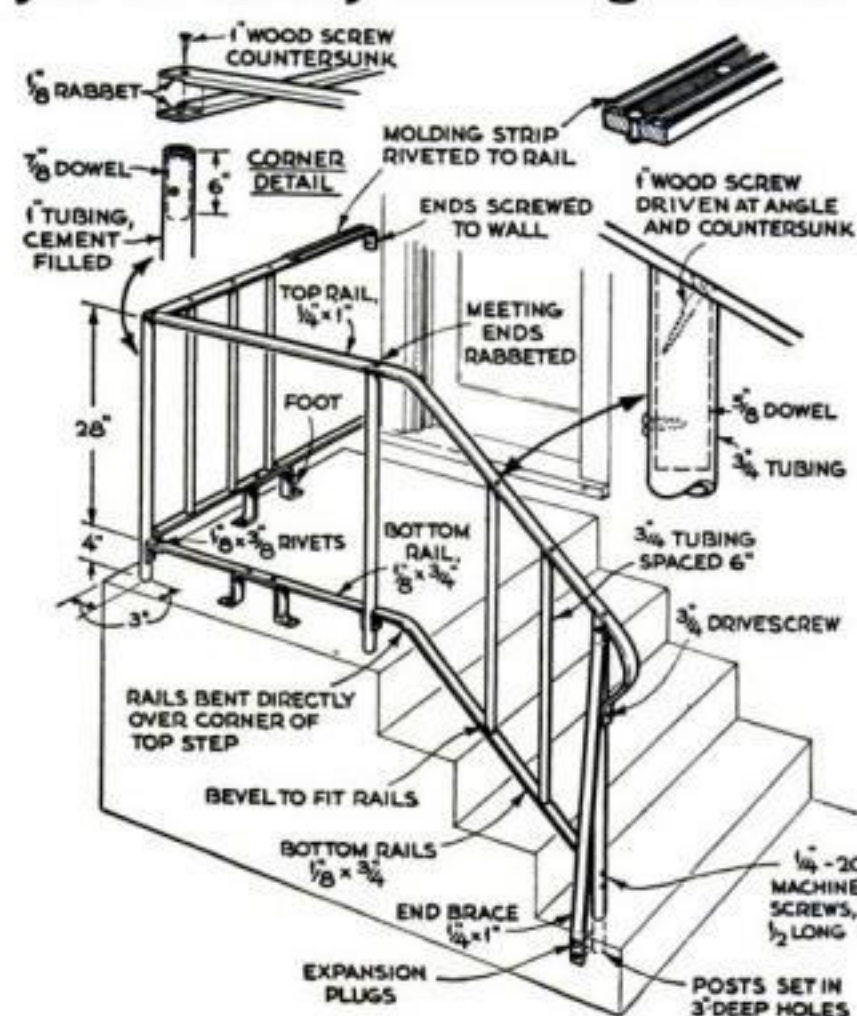


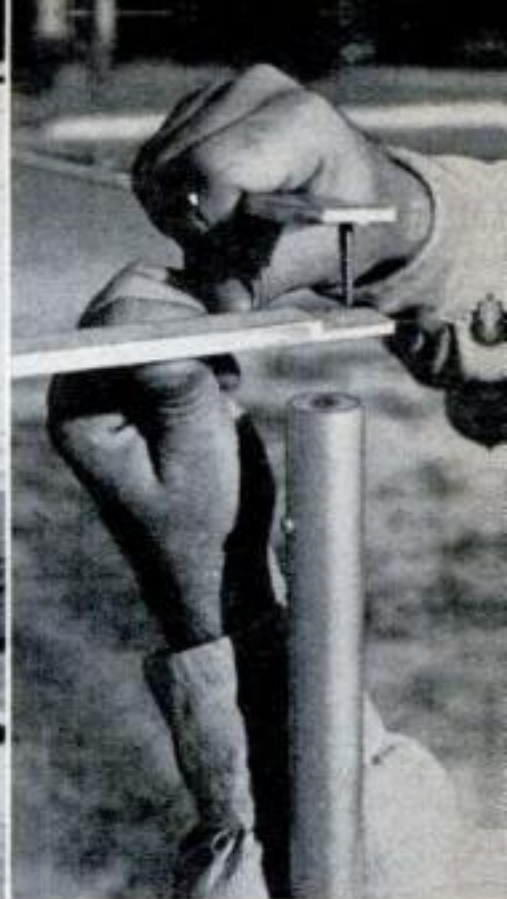
ROLLED EDGE is formed with a wooden dowel slightly smaller in diameter than desired roll. On the circular saw, cut a $\frac{3}{16}$ "-deep kerf along the dowel. Insert edge of sheet aluminum, and holding it firmly against a flat surface, roll or twist the dowel to wrap the metal around it, being sure to keep dowel straight.



Modern Railing

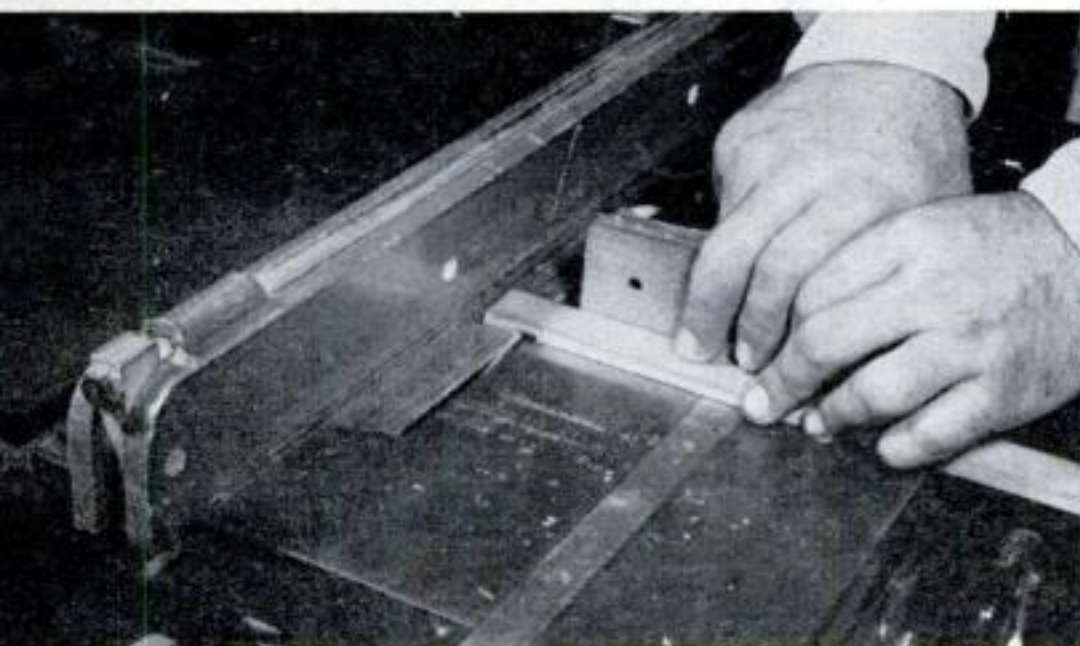
Here, the light aluminum is put together for a finished job as sturdy as wrought iron.





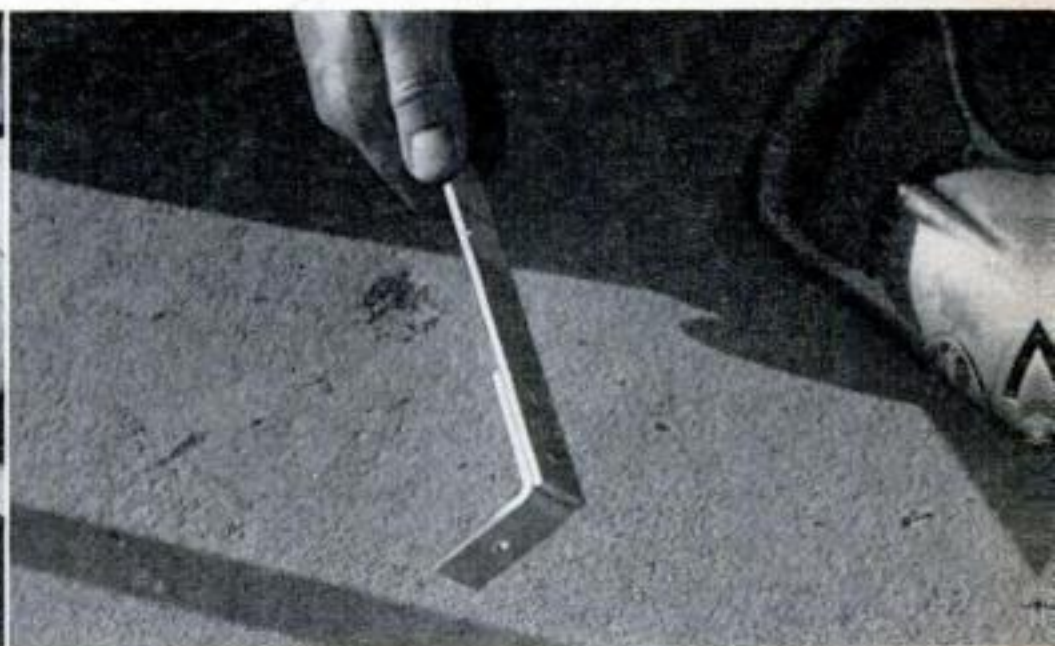
FILL SUPPORTING POSTS with cement to add strength and eliminate springy feel (left). Use dowel to tamp cement down, leaving top 6" clear for dowel fastening plug. Set posts in 3"-deep holes drilled or chiseled in steps and landing. Plumb each post and brace with

wood strips (center) to keep it vertical while you trowel cement around base. Leave braces until cement hardens. Screw top rail on posts, using rabbeted joint (right) to form corner. If steel screws are used, lacquer them to minimize galvanic action that pits aluminum.



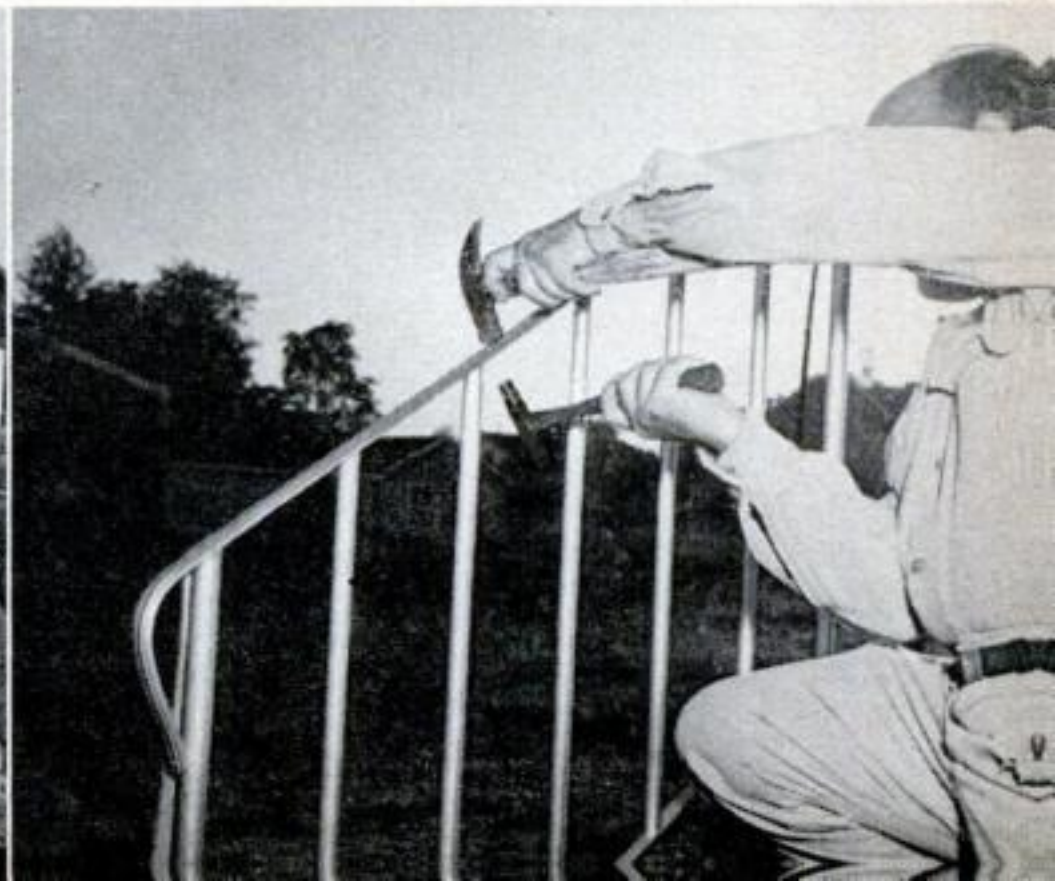
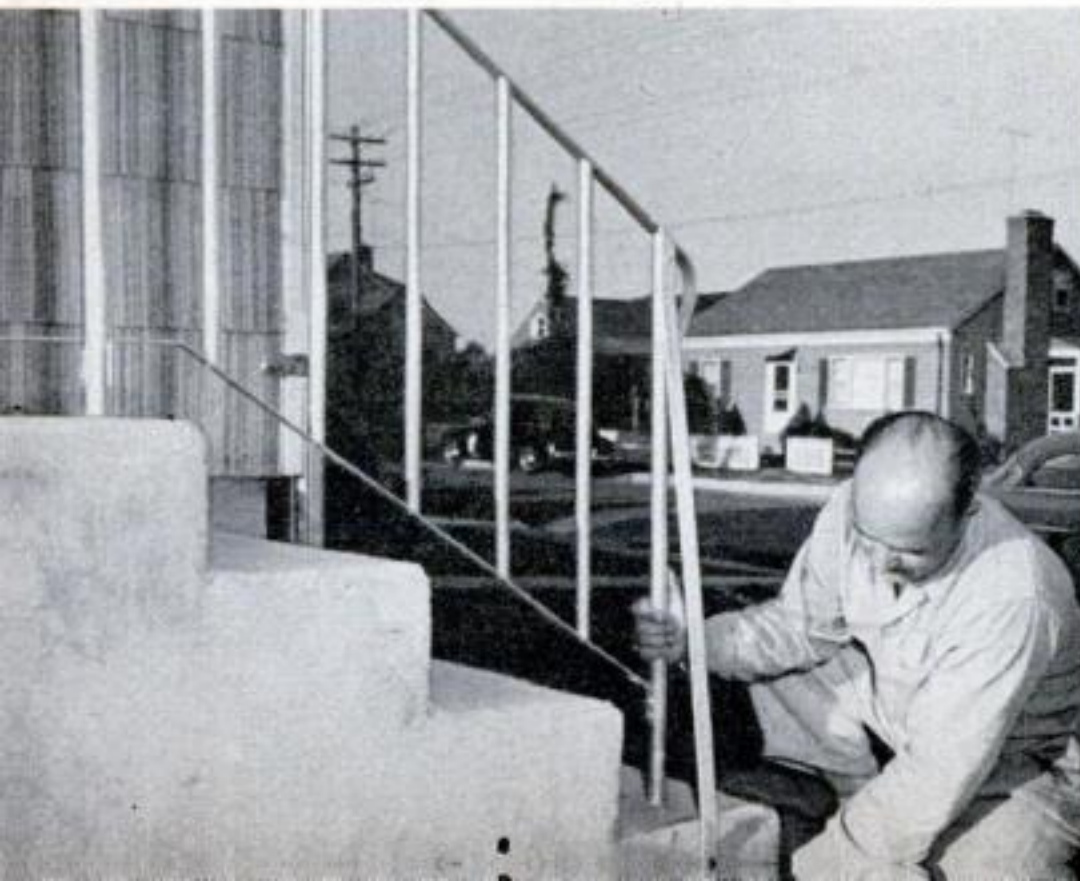
MAKE SERIES OF PASSES over saw blade set to $\frac{1}{8}$ " height to cut rabbet in aluminum bar. Hacksaw will do the job, but not as neatly. Smooth off kerf marks with wood chisel or file.

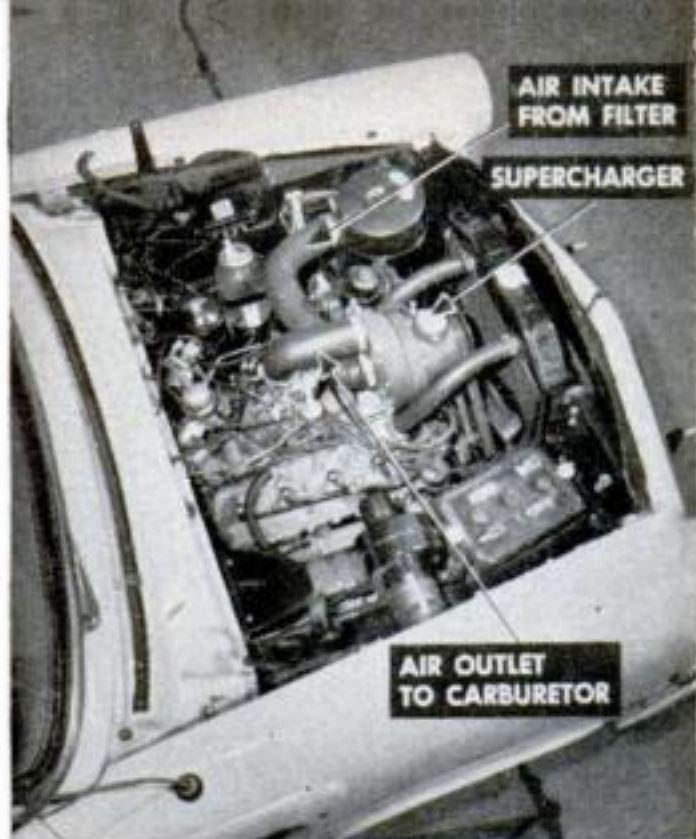
BRACE FOOT OF RAILING with bar attached to side of step with metal expansion plugs set in holes chiseled in concrete. Aluminum machine screw attaches top of bar to railing. Decorative feet, bent from stock used for lower rail, prevent sagging between posts.



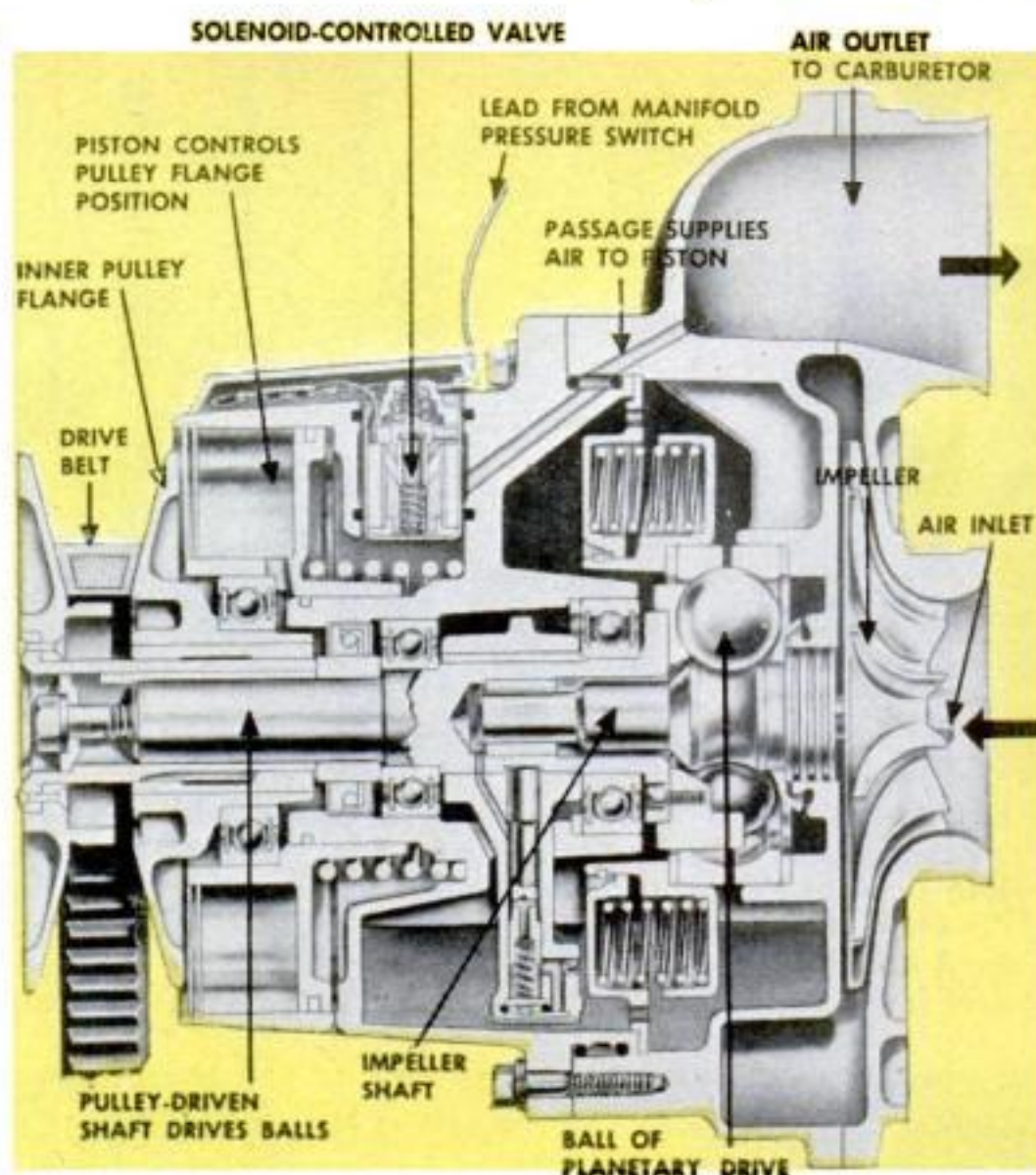
INSTALL LOWER RAIL between posts. Bend one end, cut to length and fit angle to other end. This eliminates job of making two bends at accurate locations. Fit verticals between rails.

RIVET THIN STRIP MOLDING along top rail to conceal the heads of the screws that are used to attach vertical railing members. Miter molding ends at the corner. Use a drivescrew to hold the molding at the curved end of the rail. END





SUPERCHARGER is shown above installed in a Ford. Diagram at right shows how variable drive works. Drive is pictured in high-speed position. When manifold-pressure switch signals for low speed, solenoid opens valve, admitting air to push piston to left. This squeezes inner pulley flange toward its mate, pushing drive belt farther away from center of shaft, driving it more slowly.



New Blower Huffs and Puffs

Said to add 30 percent to a car's power, this new supercharger uses a two-speed drive to give your engine the air it needs.

THERE'S a new supercharger for your auto engine that blows hard when you need it, soft when you don't. An ingenious variable-speed drive does the trick. And thanks to the same device the blower gets the advantage of the low cost and adaptability of the centrifugal compressor without its inefficiency at low speeds.

The new supercharger—the McCulloch VS-57—has two gear ratios for its belt drive off the propeller shaft, giving it two speeds. Which speed is used depends on an electrical signal from a pressure switch in the intake manifold. The pressure there depends on the difference between the overriding pressure of the air-fuel mix rammed in by the supercharger and the vacuum from the suck of the cylinders.

This vacuum is high or low according to whether the engine is working easily or hard. When the load becomes heavy, the change in manifold pressure signals the supercharger to go into high speed to supply the air needed to handle it. When the load drops, another signal sends the device back to low speed. Thus the supercharger runs

at its more efficient speed when this is needed, regardless of engine speed.

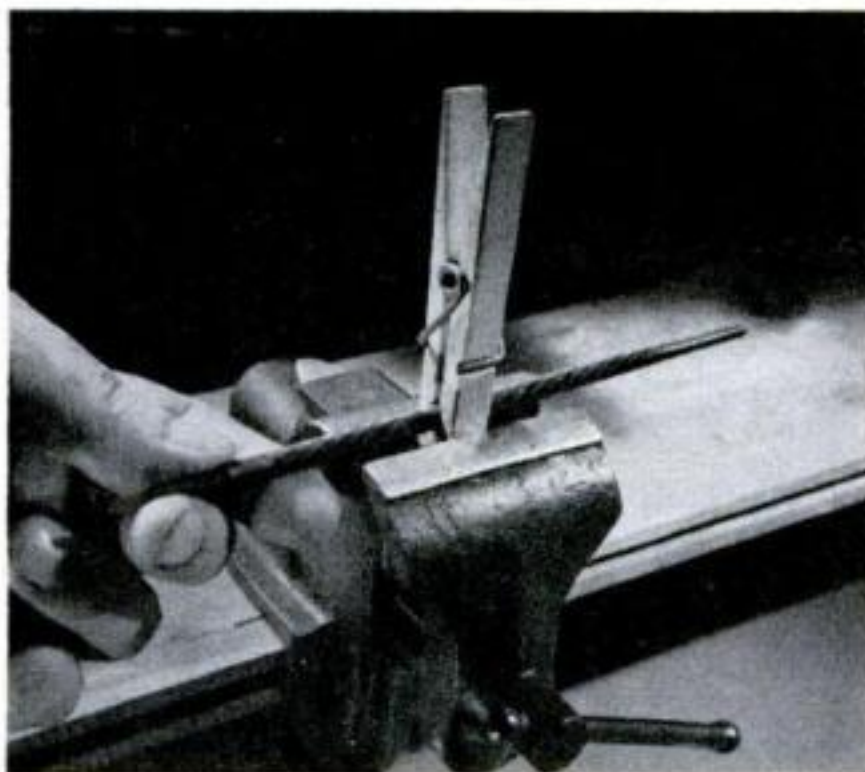
In addition, a governor device keeps the supercharger from running dangerously fast. This shifts it to low speed when the impeller goes faster than 30,000 r.p.m. or the air pressure at the carburetor exceeds five pounds per square inch.

New Blower—New Position

The new blower is installed ahead of the carburetor, instead of between carburetor and intake manifold, partly because of the low hood lines on current cars, partly to make installation easier.

The supercharger pressure is used to maintain fuel pressure by leading a line to the fuel pump. Another unusual feature is the planetary transmission that drives the impeller 4.4 times the speed of the pulley drive. This uses spring-loaded balls instead of gears, cutting noise and wear.

McCulloch Motors, the Los Angeles outfit that makes the new supercharger, says the price for a complete kit starts at \$140. Kits will be made for most U. S. cars.

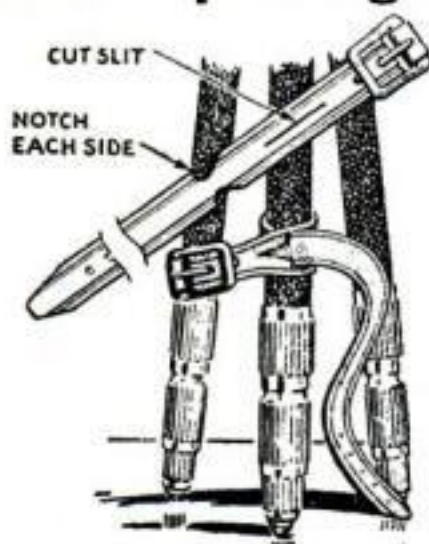


Roughened Pin Jaws Won't Slip

Wood clothespins will hold better if the gripping surfaces are roughened. You can do this by placing a small round file in the jaws and clamping the pin in a vise. Use just enough pressure to force the file into the wood.—*Ken Murray, Colon, Mich.*

Strap Holds Camera-Tripod Legs

A LEATHER skate strap notched and fitted as shown will keep the legs of a tripod together while it's being carried. Looped around one leg, it won't be lost.—*G. Wagner, Delmar, N. Y.*



One-Legged Brunch Bar Fits Into a Kitchen Corner

BUILT against a low kitchen partition, this neat brunch bar saves space—and steps for the housewife. Construction is merely an 18"-wide top with a cleat to which a

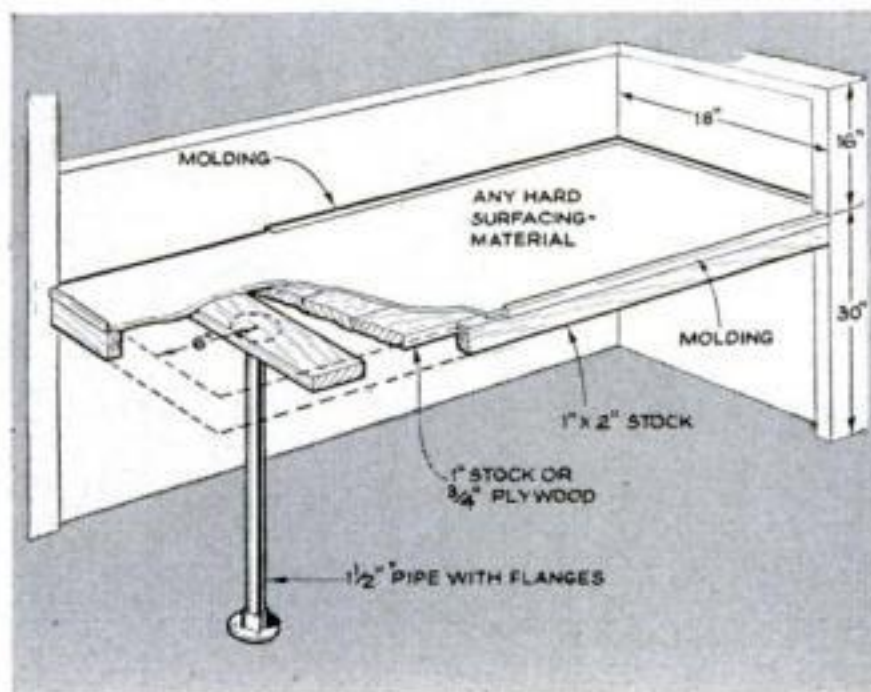


Mirror Subs as Light Bulb

MY DANGLING cellar bulb didn't light up the stoker bin so that I could see to fill it. Now the bulb does—with a mirror. I fastened the mirror to the ceiling and tipped it to reflect light into the bin.—*Hallie H. Holt, Springfield, Ill.*

Typing Marks Ruler in Tenths

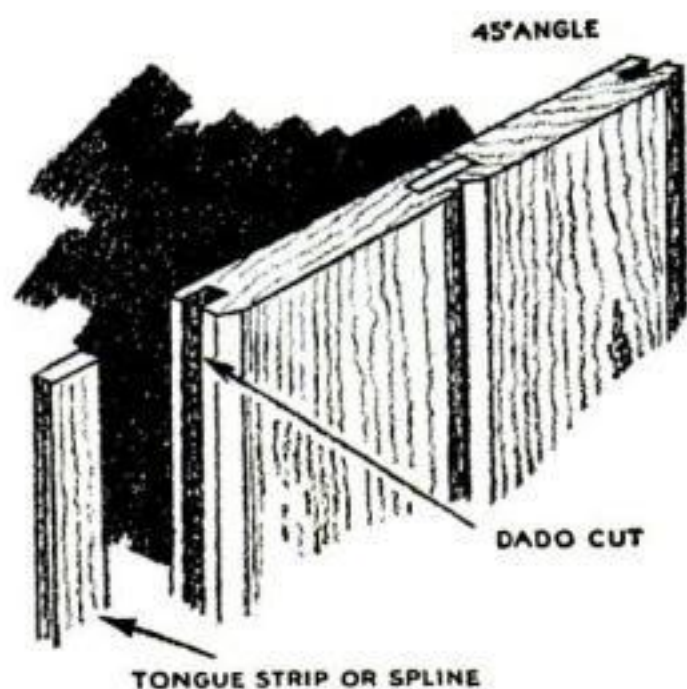
TO CALIBRATE a ruler in tenths of an inch, use a typewriter with pica type. Type a series of digits from 1 to 0, then type an apostrophe over each number. Paste the strip of paper on the back of the ruler and cover with clear cellulose tape.—*Harry Nelson Webster, Nutley, N. J.*





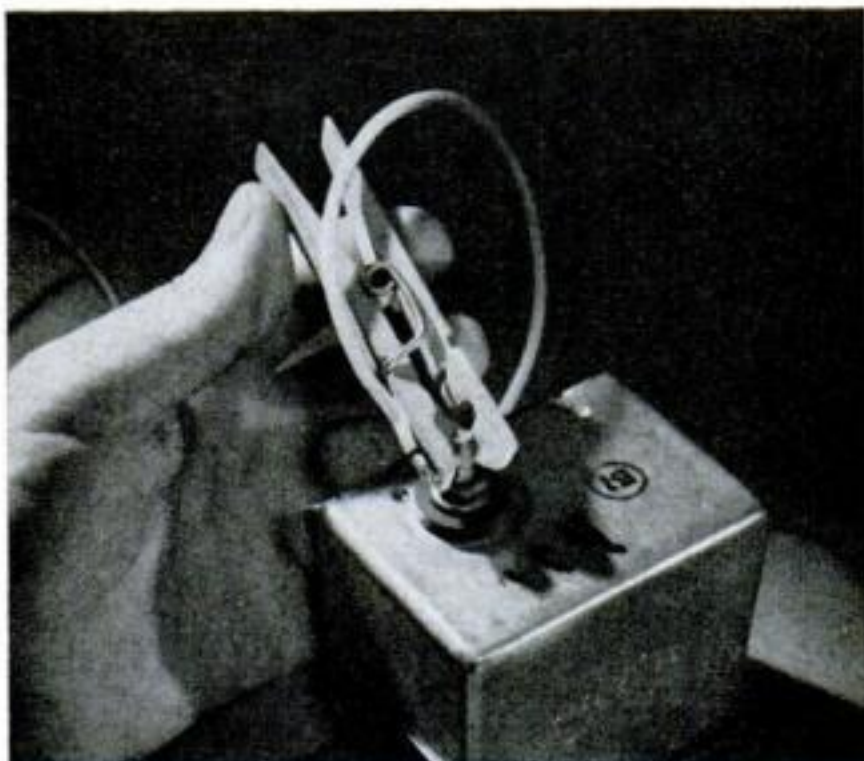
Try This When Painting Walls

A SIMPLE device for keeping paint off the baseboard can be made by tacking weather stripping to the edge of a board about 3' long and 10" wide. Let the stripping overhang on one side. Rest the overhang on the top of the baseboard and the bottom edge of the board on the dropcloth.—*E. K. Harden, Cincinnati.*



Tongue Strips Cut Panel Waste

PROBLEM: How to use some white-pine boards with plain edges for paneling without cutting a tongue and sacrificing part of the width. My solution is shown in the drawing above. After chamfering the edges of each piece at a 45° angle on the jointer, I grooved the edges with a dado saw. Then I sawed narrow strips from other material for splines.—*R. S. Wilkes, Keuka Park, N. Y.*

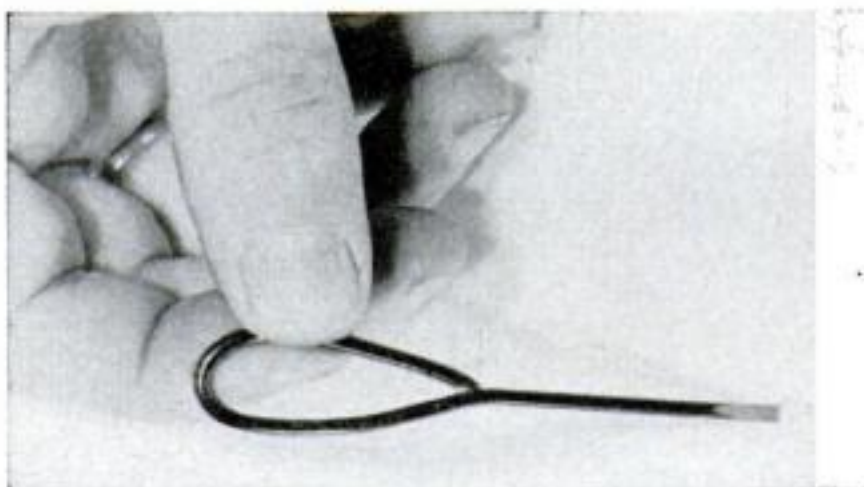


Clothespin Is Electric Clamp

IF YOU lack an alligator clamp for temporary connections in electrical circuits, drill a small hole through one jaw of a wooden clothespin, insert a metal thumbtack and solder a wire to the projecting point. Groove the tack head so it won't slip.—*Ken Murray, Colon, Mich.*

Marking Parts Avoids Mix-Up

EVER take a small electrical part out of its carton—only to find later that the power rating and similar data were thrown out with the wrapper? You can avoid this headache by marking each part with waterproof India ink. Before marking the part, clean the label area with a piece of steel wool.



Screwdriver Made from Wire

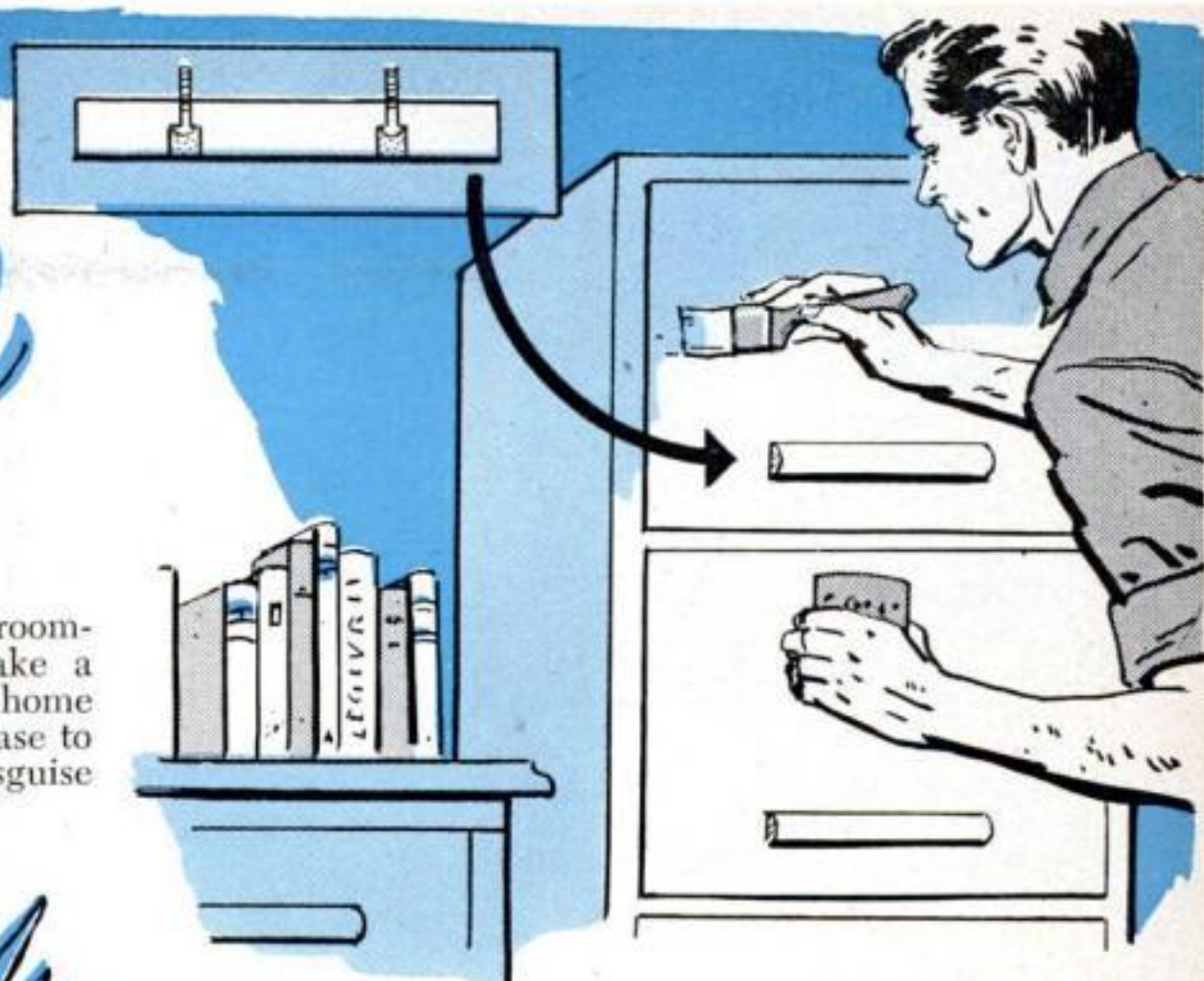
A SCREWDRIVER for small jobs can be made from coat-hanger wire. Form the handle with pliers and file the end of the wire on opposite sides to fit the desired screw slot.—*John J. Rea, Urbana, Ill.*

KEEPING THE

Home

SHIPSHAPE

Drawer pulls cut from a broomstick or dowel rod will make a metal office file look more at home in your home. Painting the case to match other furniture will disguise it still more.



Weight that vase of heavy boughs and it will be less likely to tip. Fishing sinkers or bits of bar solder dropped in the bottom and covered with melted paraffin will help to keep the vase steady.



To keep a tree green longer, saw off the trunk on a slant. The longer cut will let it take up more water. Keep the butt dunked while the tree is stored, as well as when set up.

Scrap evergreen that you trim off your Christmas tree when shaping it can be put to good use as decoration for table or door. Just stuff it into a wicker mail basket or beribboned bread pan and glamorize with balls and bows.

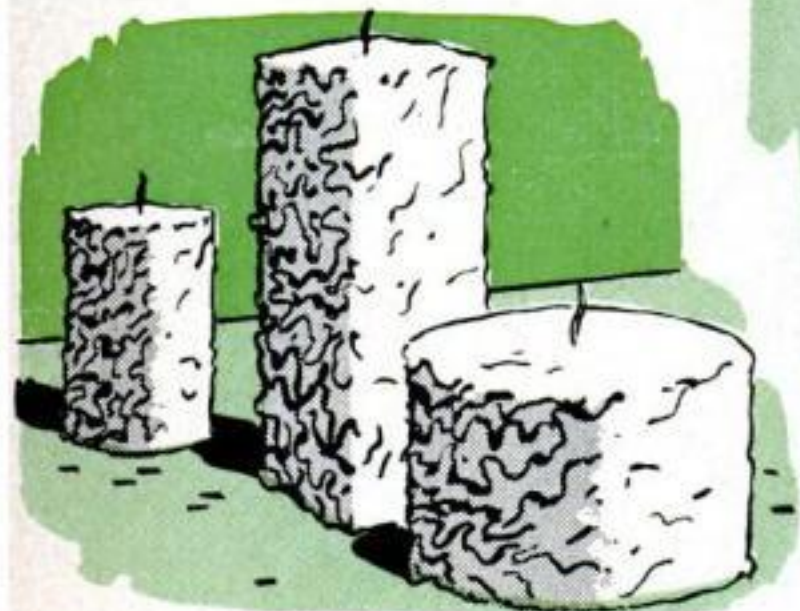


A plastic circle cut from one of those transparent boxes in which cheese wedges come packed makes a good temporary lens for a flashlight. Use the broken glass lens as a pattern.

Please turn the page for more home tips.

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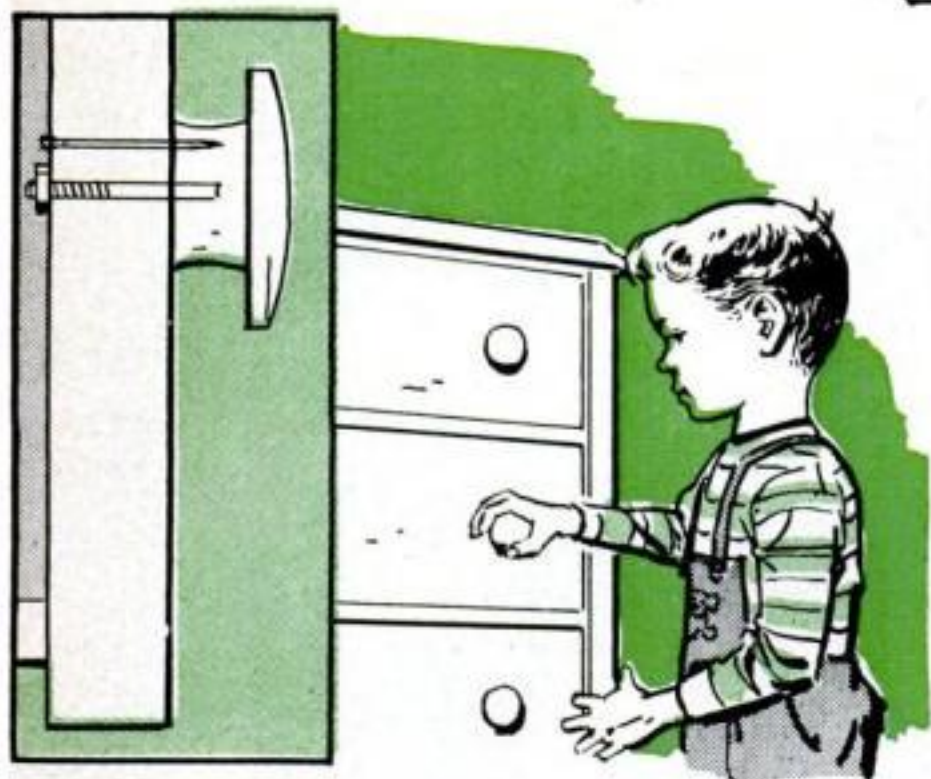
More Home Tips



To make frothy-looking candles, melt new paraffin or old candle stubs over boiling water. Then beat the wax while it is still semiliquid.



Christmas cookies can be stamped out with plastic toys to add new and different shapes for youngsters to choose from. Search dime-store counters for hollow toys in designs not found in regular cutters, then separate them down the middle.



To anchor wooden-knob pulls on cabinets and furniture so young children can't spin them off, drive a small finishing nail through the drawer front and into the knob as shown.



To soften putty, run the flame of a small alcohol torch around the glass edges. In cold weather, putty for the new pane can be heated the same way to make it easy to smooth.



Squeaky floors in rooms over a basement can be hushed by driving wood wedges between the sub-flooring and the joists. A helper walking across the floor overhead will turn up noisy spots.



Unusual Doors Are Easy to Make

Decorated plywood over a core of softwood will add a custom note to your home.

INDIVIDUALLY designed doors for your home can make the difference between that assembly-line look and an air of expensive custom construction. It is surprisingly easy to make the flush type—just a core of inexpensive lumber covered by plywood.

Plywood permits all kinds of decorative tricks. You can even make each side of the door different. The one I made has textured

plywood on the exterior to match the house siding and grooved plywood on the interior to match a paneled room.

Choose core stock and plywood so that total thickness of the three layers is $1\frac{3}{8}$ " to $1\frac{1}{2}$ " for interior doors, $1\frac{1}{2}$ " to $1\frac{3}{4}$ " for exterior doors. It is best to use exterior-grade plywood and waterproof glue in outside doors.
—Darrell Huff, Sonoma, Calif.



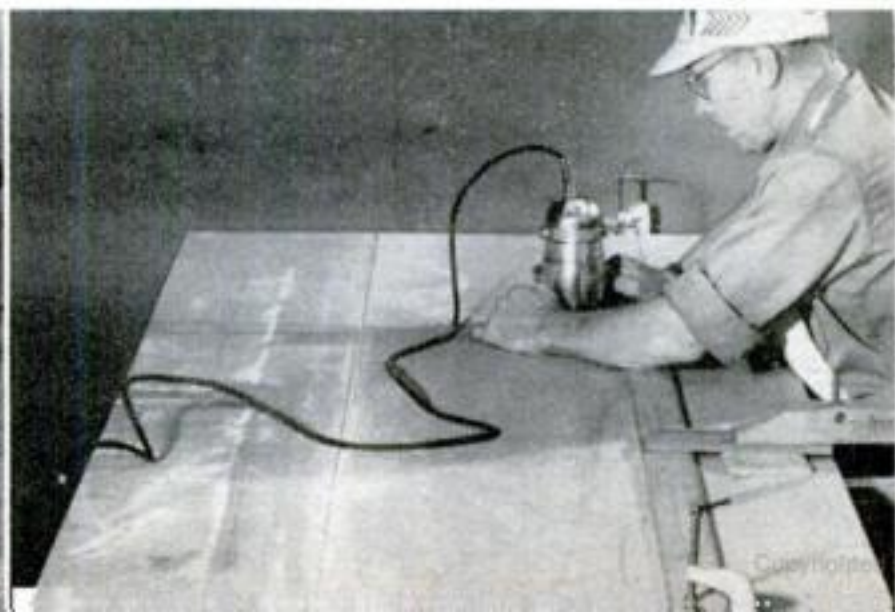
CORE starts with mitered frame of softwood sized to opening. Glue and corrugated fasteners hold joints, which need not be unusually strong (plywood face takes care of that).

PLYWOOD FACE, trimmed to door size, is nailed and glued to each side of frame. Set nails and fill holes. Door is now finished unless you want to add special decoration.



FIVE CROSS STRIPS are glued into frame. Four are narrow (about 2"); fifth is wider to receive door lock. Place it so that it centers about 44" from bottom of door.

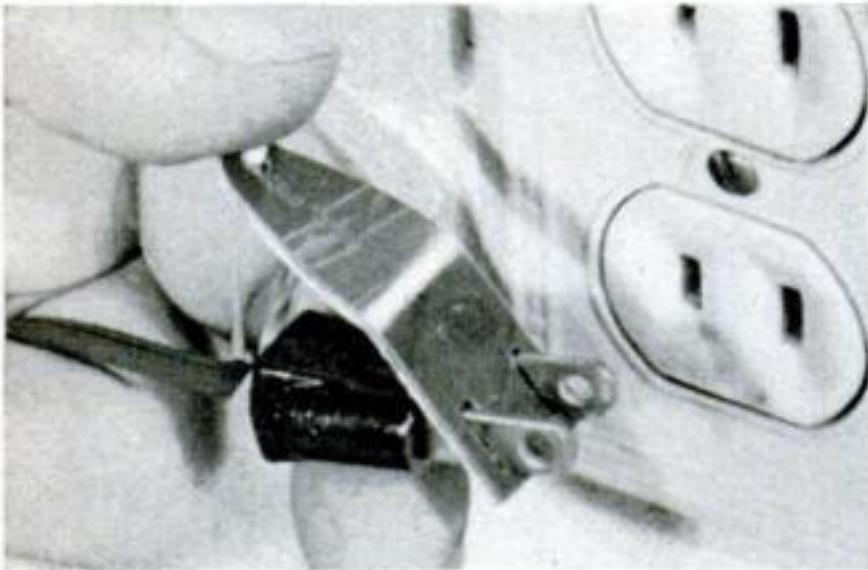
TO MATCH PANELING of room walls, one face of this door was grooved by routing channels $\frac{1}{4}$ " wide and $\frac{1}{16}$ " deep at equal intervals. Many other interesting patterns are possible.



New for the Handy Man

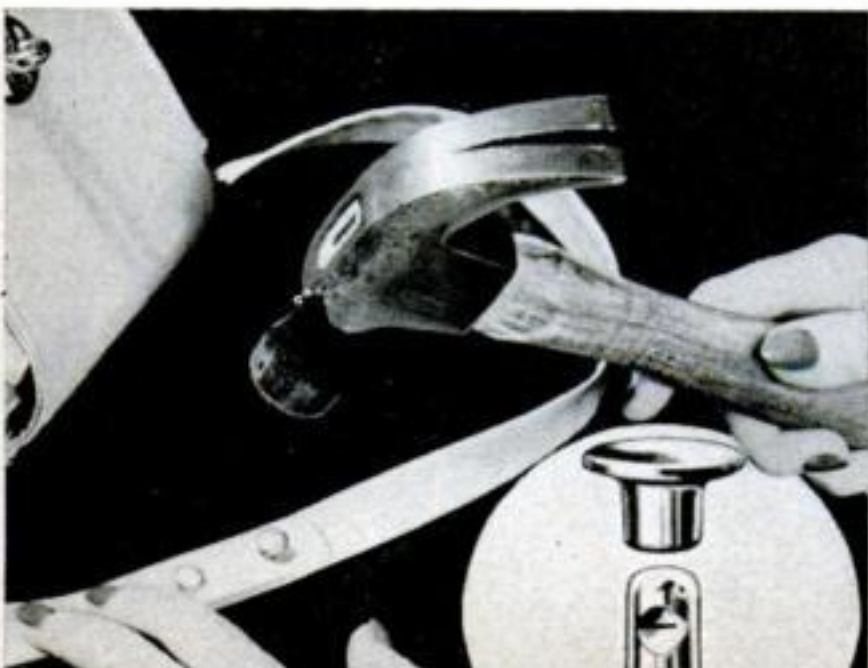
1. Pine Paneling Pre-finished.

Nail up these knotty-pine boards and your paneled wall is completed. The $\frac{3}{4}$ " boards, textured by blasting and brushing, come already sanded, stained, lacquered, waxed and buffed. They are made with ship-lap joints in five colors, 6" and 8" widths.



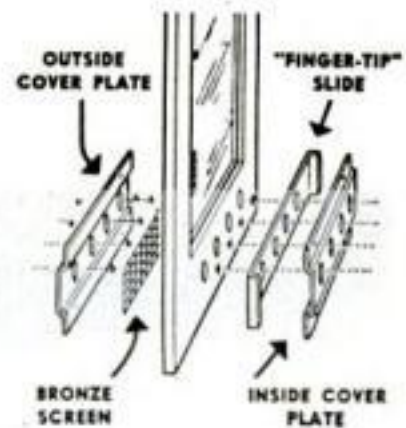
2. Lever Grips Tight Plugs. Appliance plugs that stick tight in wall outlets can be pulled out more easily with the Plug-Lever. A slotted plastic strip, it fits over the prongs to provide a thumb grip.

4. Rivets Hammered in. These lightweight rivets are used for decoration or for fastening cloth, leather, paper and plastic. You assemble the rivet through holes in the pieces to be fastened, then flatten it with a hammer. They come in several finishes and sizes, cost 15 cents a card.



3. Tube Fixes Loose Wallpaper. If your wallpaper comes loose along the edges, the flexible tip of the Paste-Bak tube gets fresh paste underneath where it's needed. The paste won't spot the paper.

5. Vent Attaches to Storm Sash. You can add these aluminum vents to wood or metal storm windows to provide the slight ventilation often needed in winter. The Slide-O-Vent has a sliding door that lets you open the vent holes any desired amount. The holes drilled in the sash are $\frac{7}{8}$ " in diameter, the vent is 2" by 8 $\frac{1}{2}$ ".

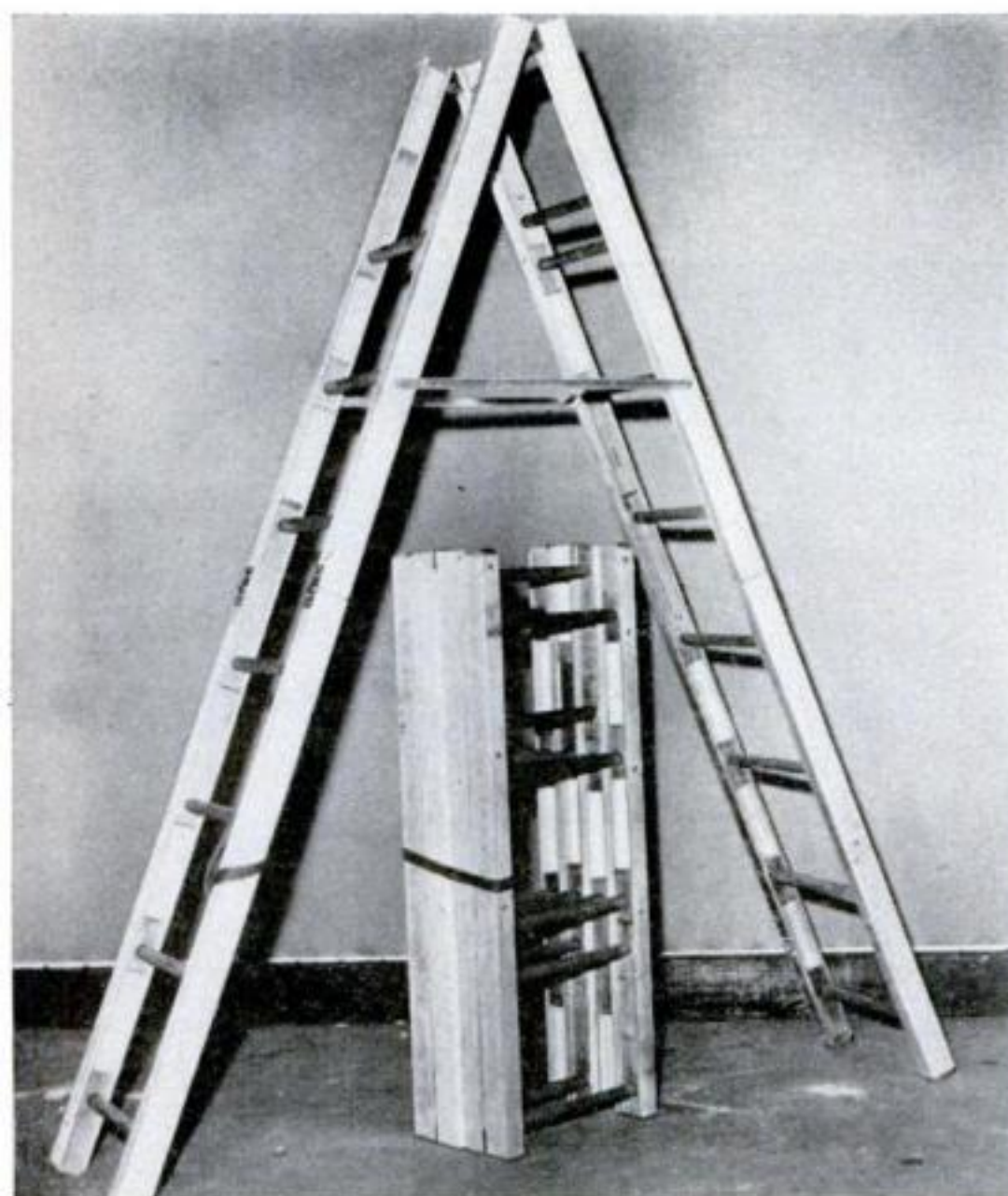




6. Glass Filters Heated Air. The dust often deposited by gravity warm-air furnaces can now be reduced by simple glass-fiber filters installed under the registers. Glasfloss comes in rolls, is cut to size and fastened to the underside of the register grille.



7. Sandpaper Kit. You no longer need the lore of a cabinetmaker to choose the right sandpaper for refinishing furniture. A new kit contains 3 $\frac{3}{4}$ "-by-9" sheets of the eight different types of abrasive needed for such a job—with a booklet explaining how to use them. It sells for less than \$1.



8. Ladder Folds. From a bundle less than four feet long, a collapsible ladder unfolds into a 14' 8" utility ladder. It can also be used as a seven-foot stepladder (above) or scaffold. The 36-lb., wood-and-aluminum Porta-Fold can support 1,000 lb.



9. Paint Mixer Fits Can. You can leave this mixing paddle in the can while you paint. Its lid covers only half the can and also provides a straight edge for wiping the brush. Called the Prop, it also has a hook for hanging up your brush.

Further information on these products can be obtained from: 1. Amerwood, Box 391, Fort Worth, Tex.; 2. Morgan Products, Box 213, Palo Alto, Calif.; 3. Majestic Gifts Co., Box 1447, Beverly Hills, Calif.; 4. Columbia Fastener Co., 3232 S. Ashland Ave., Chicago; 5. Rene-Craft Products, 22 Owens Building, Wilmette, Ill.; 6. Glasfloss, 155 E. 44th St., NYC 17; 7. Carborundum Co., Niagara Falls, N. Y.; 8. Porta-Fold Co., 525 Alvarado St., Los Angeles; 9. International Allied Industries, Box 202, Hialeah, Fla.

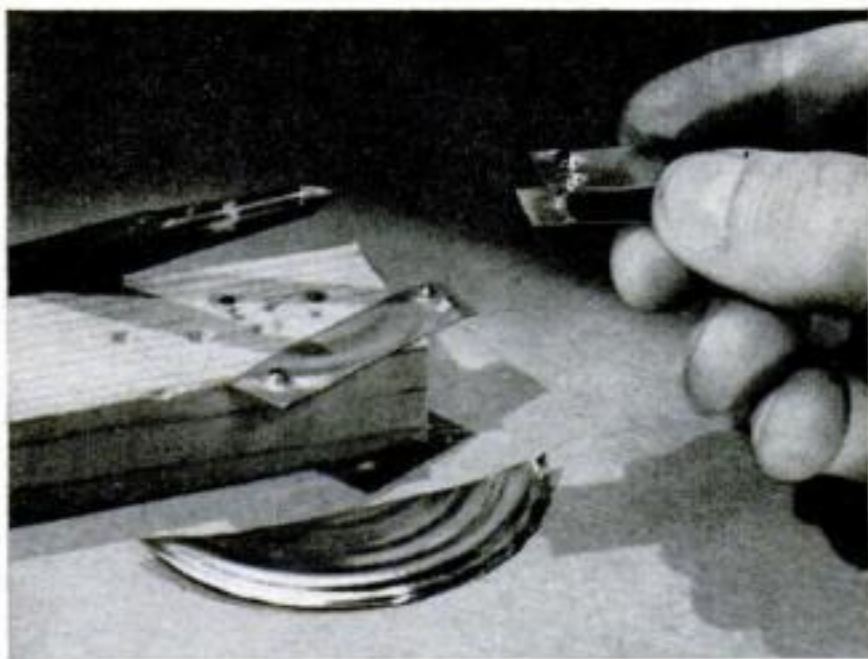
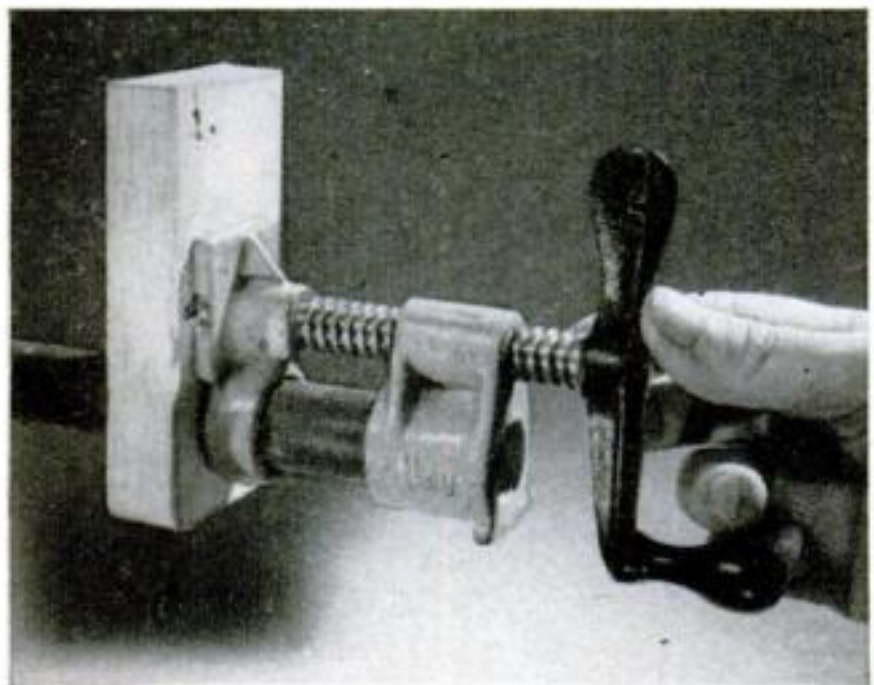
Trouble Light Aims TV Antenna

A TROUBLE light is almost as good as a pair of walkie-talkies when you're trying to aim a TV antenna at the transmitting stations. Extend the light out a window where it can be seen by the man on the roof. The man watching the screen image inside flashes the light fast if the antenna is way off, then slows the flashing to a stop as the correct orientation is reached.—*Arthur R. Tanner, Cold Spring, N. Y.*



Ironed Tape Comes Unstuck

You can remove cellulose tape from paper or cardboard without tearing off a layer of the surface with it by first heating the tape with an electric iron. Set the iron at about the temperature for rayon or silk and run it over the tape several times. The heat will temporarily melt the sticky adhesive so that the tape can be peeled off easily. As the tape cools, most of its tackiness will return, enabling you to use it over again several times if necessary.—*Ken Murray, Colon, Mich.*



Can Tops Make Clothes Clips

SIMPLE clips for attaching tags to a coat lapel or other clothing can be made of metal cut from a tin-can top. Snip the top into narrow strips, then punch two deep marks in one end of each strip and one mark in the other end. Folded into a U shape with the punched metal on the inside, each strip can then be quickly clipped to several thicknesses of cloth.

Wood Pads Enlarge Clamps

You can make your bar clamps hold larger stock by fastening on wood extension pads like this (left). Each hardwood block is drilled at one end to slip over the pipe and is held to the clamp jaw by two round-head screws.

How I Expanded My Garage

Two cars now fit between the walls where only one used to go.



1. I STARTED WITH THIS one-car garage. First I laid a new foundation for the wall I planned to move. Next I removed doors, sheathing from ends and shingles from roof peak. Then I separated rafters at peak by hacksawing nails.



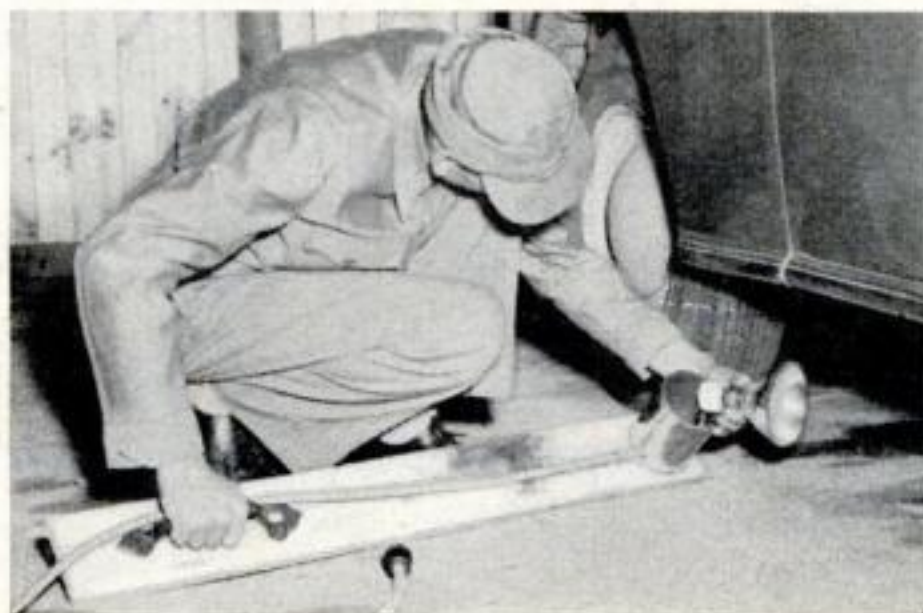
2. WALL WAS SHIFTED by wedging it up, laying sheets of greased iron plate across old and new foundations and prying it to new location.



3. RAFTERS WERE RAISED to a higher peak by spiking on extensions and new cross-beams were attached to old after wall was anchored. Extra studs were added at ends.



4. I WOUND UP WITH THIS two-car garage. All the old siding was used, plus just enough new to finish. New floor was laid after old footing was knocked out. New door was largest item in \$300 materials bill. Counting two friends' help in moving the wall, I estimate the job took 200 hours.—K. G. Byar, Cincinnati.



Lamp on Board Keeps Oil Warm for Easier Starting

For cold nights, here's an easy way to keep your engine oil warm. Buy a 150-watt Pyrex-type bulb for outdoor use. On one end of a 48" board mount a tin can with a porcelain socket inside. The can will hold the bulb upright and help reflect heat. Connect armored cable to socket and attach plug to other end.—W. Gilman, Middletown Springs, Vt.

Gus Rides

On a storm-swept Christmas Eve, Gus digs deep into his bag of tricks to save a cargo of holly—and an old man's faith.

By Martin Bunn

WHEN Knute Hansen drove his pickup truck to the pumps at Gus Wilson's Model Garage on that gray afternoon before Christmas Eve, Gus knew where he was bound.

It was near closing time. The sky was brooding and sullen. The very air was thick and heavy. Gus sniffed the weather as he filled the gas tank. Out of the corner of his eye, he studied the old man at the wheel.

Everyone knew Knute. Small, rheumatic, a mere wisp of a man. Knute made a meager

living doing odd jobs around town. Christmas time was his chief joy. It was then that he gathered holly, fashioned it into beribboned wreaths and bunches and sold it in the tiny town of Highland, high in the mountains.

Knute enjoyed a monopoly. No one in Highland would think of buying holly from anyone but him. And the holly was free to those who couldn't pay. Knute took an extra measure of pleasure in Highland. His daughter, her husband and three children lived there.

Gus screwed on the gas-tank cap, hung up the hose and walked up to the cab.



with Santa Claus

"Merry Christmas, Knute," he greeted the old man. "Headed for a visit with your daughter, eh? Better take it easy. Weather looks bad."

Knute thrust his head out the window.

"Yah!" he said with satisfaction. "Every year I go home to my Frieda. Maybe this year, Gus, you like to go along?"

Sky Looks Forbidding

"Go along!" Gus exclaimed. "I've got no folks in Highland."

He glanced again at the forbidding sky.

"That's yust it," Knute declared, his faded, blue eyes beaming with friendliness. "I bane widower, so I go at yule time to my daughter. You bane bachelor man, so you go along with Knute and have one good time for yourself."

"But I've got to be in town tomorrow," reasoned Gus. A chilling gust of wind struck his face.

"That's all right," Knute told him. "You go to Highland with me for Christmas Eve. Tomorrow you drive my truck back. After New Year my daughter and son-in-law bring me back to town."

Gus rubbed a reflective hand over his chin. Knute could get himself in a peck of trouble. But to go on a drive to Highland on a night like this?

"Wait a minute, Knute," he said. "Be right back."

As Gus rang up the state police he thought of the old man, skidding around up in the mountains on dangerous roads, with a storm threatening.

"This is Gus Wilson, down at the Model

Using the tree trunk as a pry, Gus and Knute Hansen finally managed to hoist a rear wheel.



Garage," he said when the state police office answered the phone. "How's the road to Highland?"

"It's open over the pass," the answer came back, "but there's no guarantee on how long it'll stay open. There's snow up there already, and more might come at any time."

"Thanks," Gus said as he hung up. It was something over 40 miles to Highland, over a graveled road that was only fair in summer. What the heck, thought Gus. His decision was made. He told his helper, Stan Hicks, where he was going, and left him to close the shop. He climbed in beside Knute, noting that there were chains on the rear wheels of the pickup truck.

"Let's go," he said.

"Sure," Knute declared. "We have one fine time, by yimminy."

They rolled along at a good clip until they branched off into the winding, narrow road that led up into the mountains. The truck labored with its load of holly. Snow began to spit on the windshield and it seemed to Gus

that the wind was building up. As they crawled into higher altitudes the vast, brooding hills became blanketed with snow that hadn't reached lower levels. There was six inches on the roadway, fluffing up with new fall. As they topped the summit the truck writhed in the old man's hand as the full force of the gale struck them broadside. It was a wild night for Christmas Eve.

As they moved down after topping the summit, Knute rode the brake pedal too much, not always shifting into lower gears when he should.

Gus Thinks of Taking the Wheel

Darkness was fully down now. It was snowing harder, with a cross wind that drove the storm in gray, slanting sheets across the beam of the headlights. Looking out the window Gus saw a wild, uninhabited land. He thought of taking the wheel from the old fellow, but Knute knew the twisting, up-and-down turnings of this mountain road better than he did.

The oldster was riding his brake as the truck nosed steeply down into a pocket in the mountains. As it hit the bottom, facing

a rise, Gus suddenly smelled burning insulation. Almost as the strong scent hit his nostrils, the lights went out and the motor went dead. With one slap of his hand Gus heaved back on the emergency brake. They slid to a halt.

"By yimminy," Knute declared, winding down the window and spitting into the wind, "something goes wrong."

"How right you are, by jimminy, Knute," Gus said, hitting the ground.

Here they were in a dead truck in a night black as the inside of a hat, with six inches of snow on the ground and more coming down by the minute. There would be no traffic over this lonely pass to Highland for days. Highland folks were accustomed to

being snowed in at times in midwinter. As far as Gus could figure, they were about 15 miles either way from civilization. Could they walk out? In a blizzard?

Feeling in his coveralls pocket Gus found the ever-present pencil light, pair of pliers, screwdriver, and roll of black tape.

"We should be able to locate the trouble and fix it, Knute," he said with a cheerfulness that was half counterfeit.

"We do," Knute said, and there was deep feeling in his voice, "or I carry my holly over these mountains on my back."

The words halted Gus with the hood half-lifted. He stood there in the blackness and in the wild clamor of the stormy night suffused by a feeling that was greater than his worry. This simple, kindly soul, he observed to himself, is thinking only of carrying holly to Highland.

Gus played his pencil light back and forth over the engine. The light steadied on one of the battery straps. The heavy, leaden connection seemed to have sagged down in the center. Gus reached over and touched it. It was hot. The battery had been subjected to a dead short. It had been so heavy that it had practically melted the lead connecting the cells. The battery was dead.

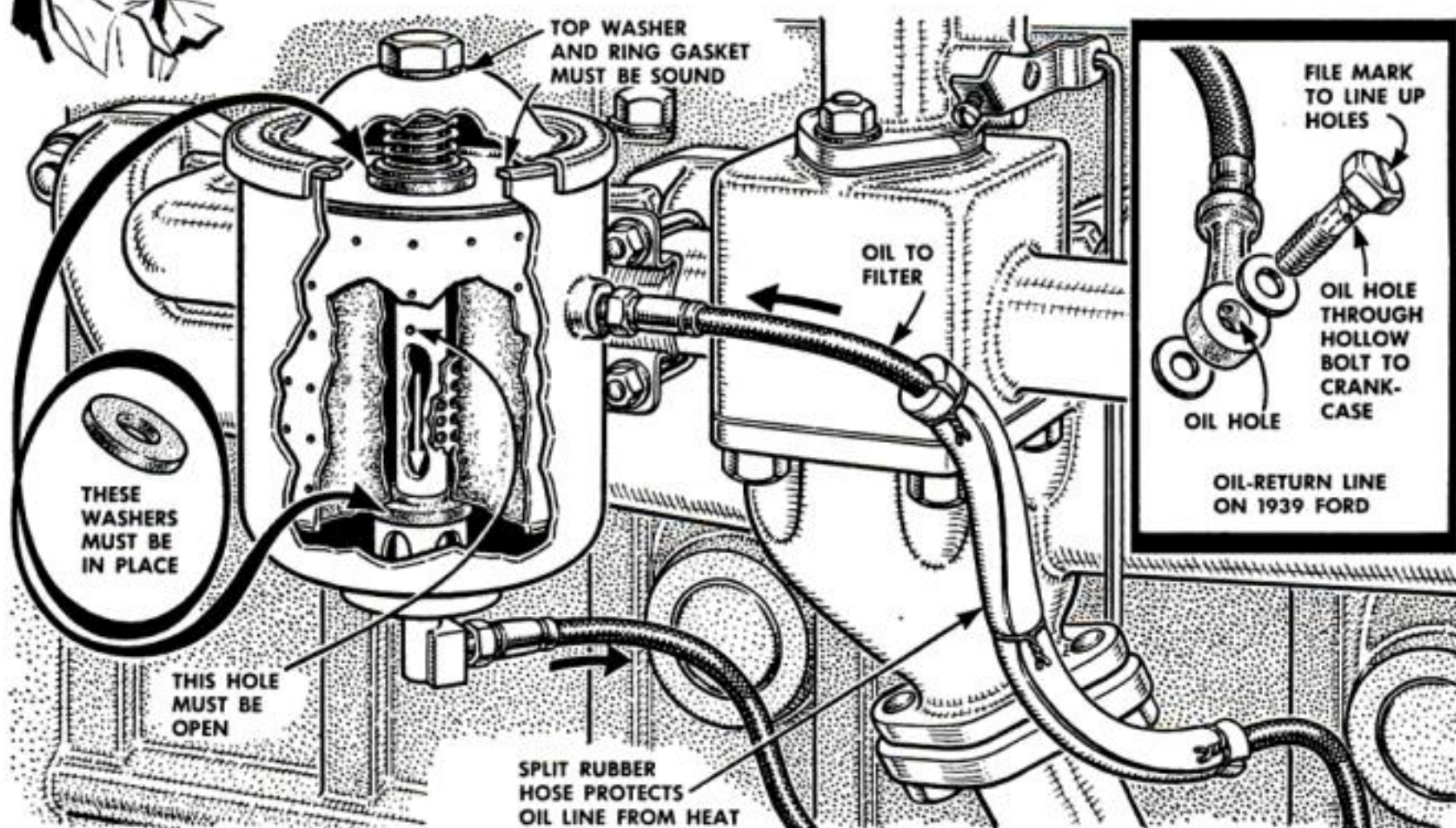
Gus recalled the burned-insulation smell. He pulled up the floorboards. There was the trouble. The arm of the brake pedal



[Continued on page 238]



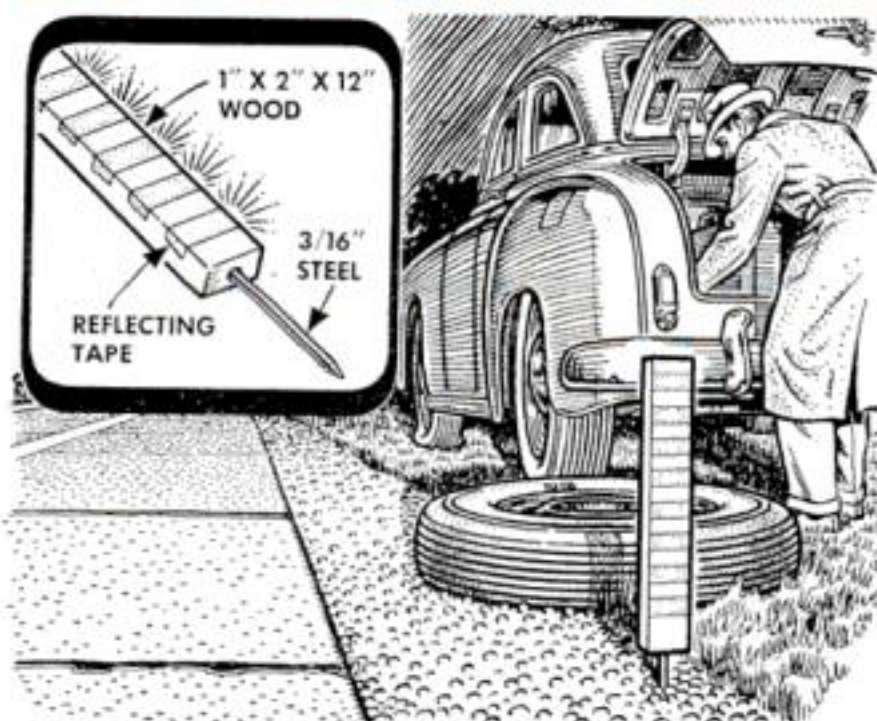
Hints FROM THE MODEL GARAGE



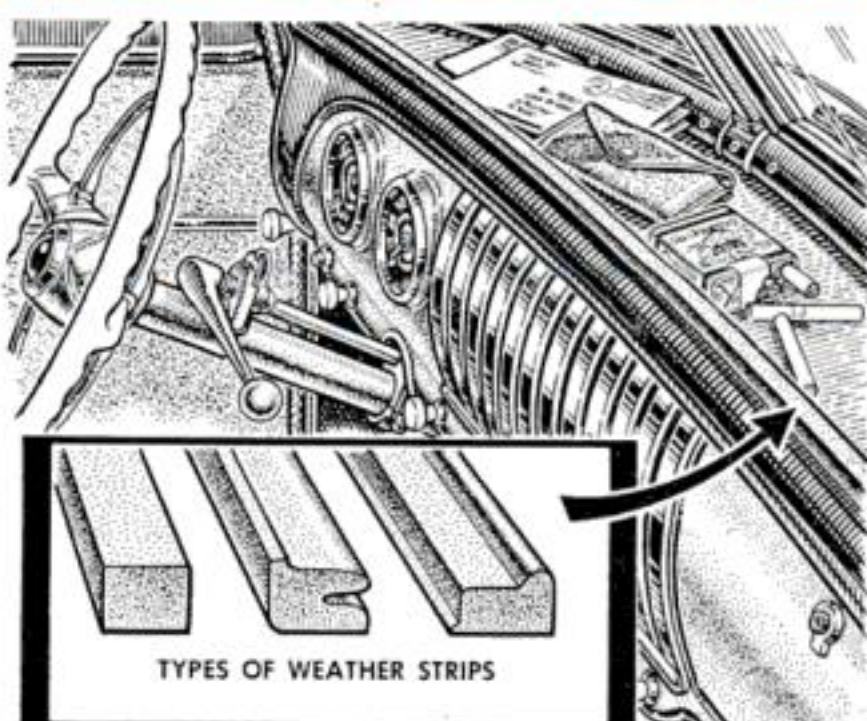
If an oil filter is not working properly you may find the reason or cure here. If the replaceable-cartridge type isn't cleaning the oil, remove the cartridge and make sure the sealing washers, top and bottom, haven't been omitted. Their job is to force oil through the element.

When an element is replaced, the small hole or holes in the hollow tube in the cen-

ter should be cleaned with a bent hairpin or wire. Clogged holes prevent filtering action. On cars where the oil line passes near the exhaust manifold, heat may weaken and break the line. Protect it with a piece of hose as shown. On some older Fords, oil returns from the filter through a hollow bolt. A mark filed in the bolt head will help line up the holes.



Reflecting tape attached to a piece of wood will give you an inexpensive warning signal for roadside breakdowns. A steel rod will support it.



Sponge-rubber weather strip cemented on the flat surface above an instrument panel provides a convenient storage place for maps, matches, cigarettes and other items.

Please turn the page for more auto hints.

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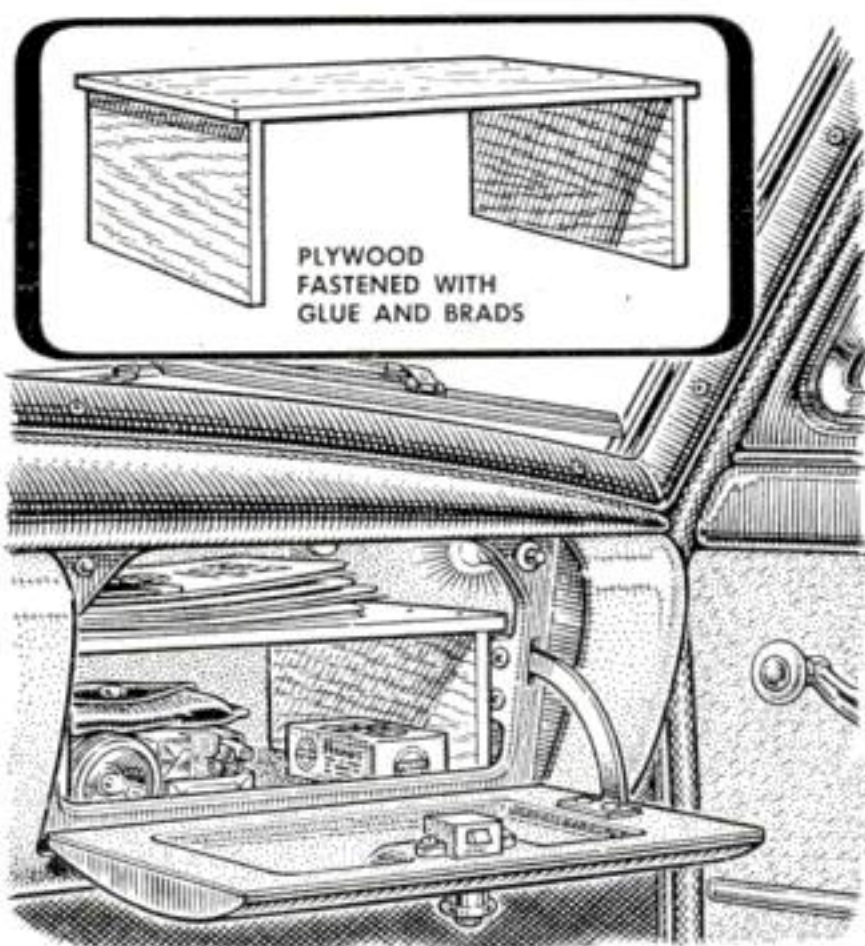
MORE Hints from the Model Garage



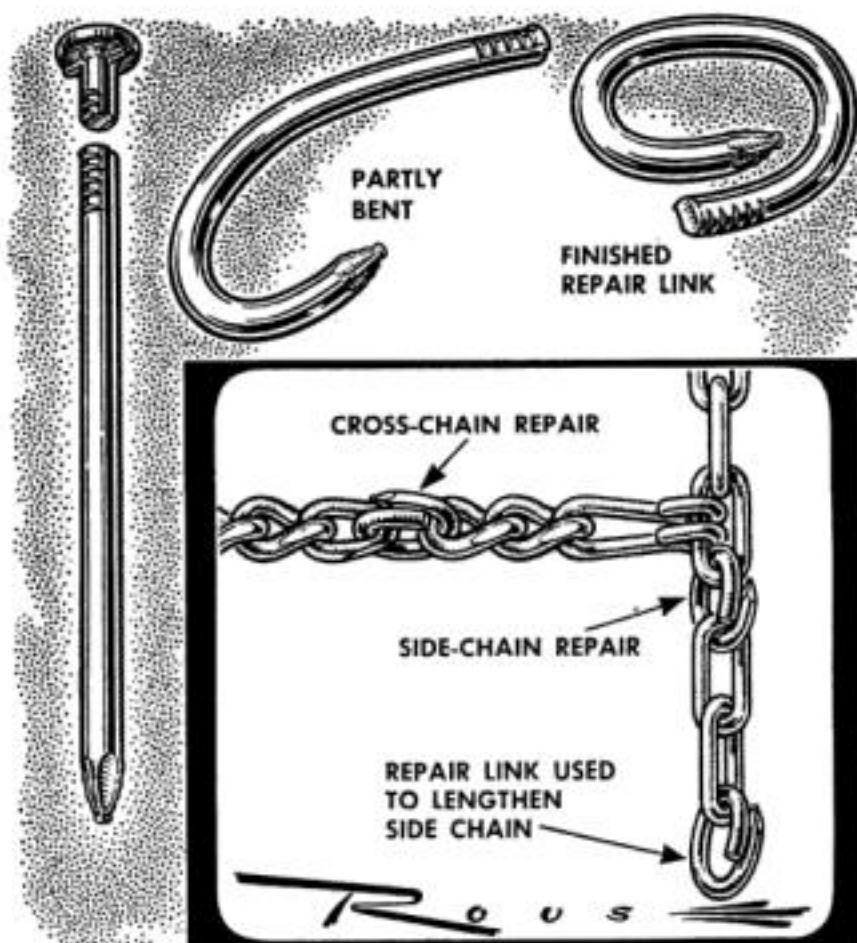
A pair of old tires can be put to use as driveway guides. Since a car can hit them without damage, they can be placed closer to the driveway than other types. Put stones in the buried section of each tire for stability.



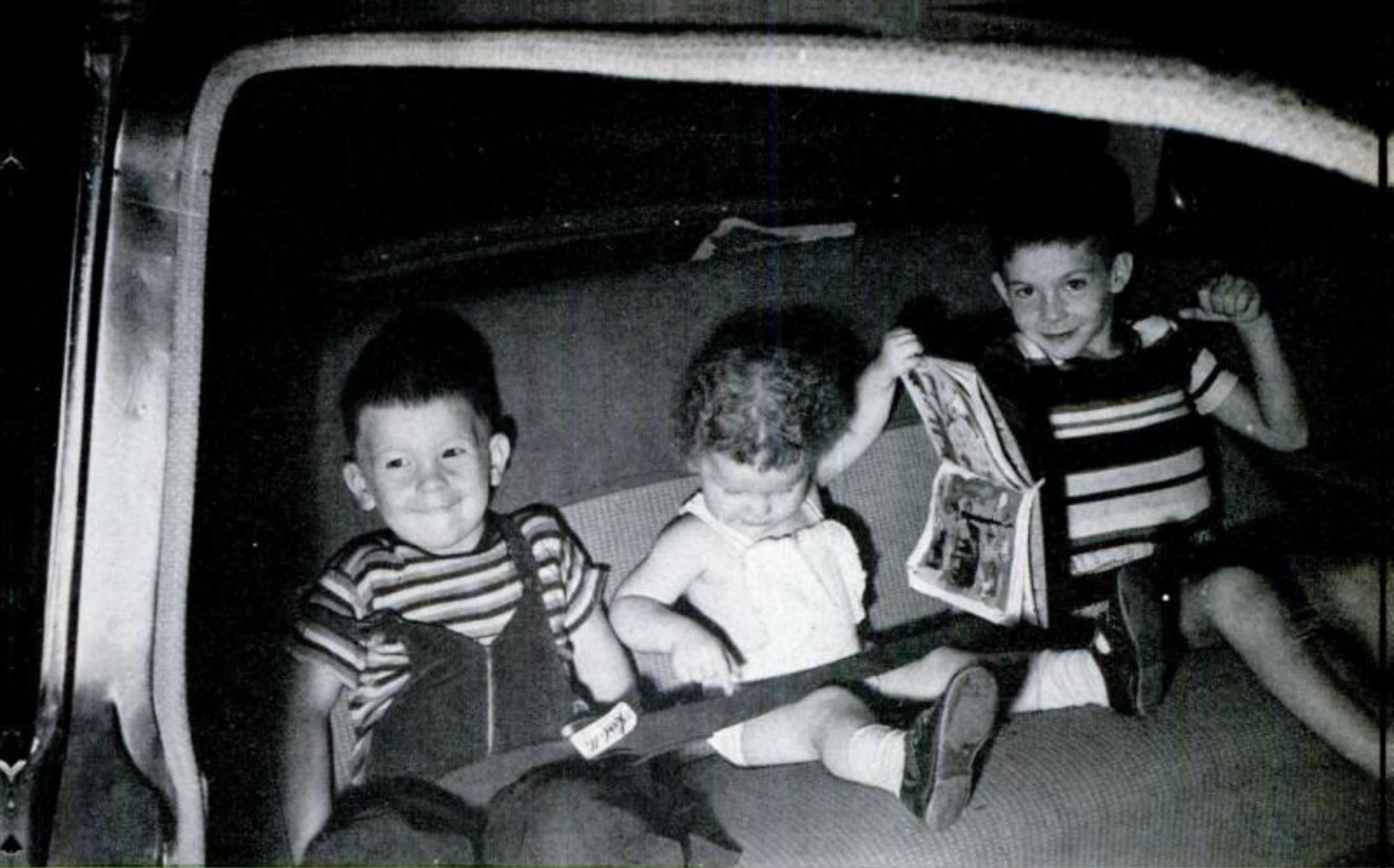
To warn of flat tires, install an extra curb-warning whisker. Bend down the end to ride about halfway between the pavement and the rim of the wheel. Then, the noise as the wire scrapes the ground will let you know the tire has gotten soft.



A wood shelf or "bench" built to fit your glove compartment will help keep the contents in order. Leave more space at the bottom than at the top so that bulky objects will have enough room. Maps and other papers will go on the top shelf.



For emergency repair of tire chains, make links from 16-penny nails. Clip off the head and bend the nail as shown, using two pairs of pliers. Leave the opening wide enough so the link can be slipped in place and then bent closed.



ALL MEMBERS OF THE FAMILY are strapped down, youngsters in the rear seat and parents in front, as the Lindsleys set out for a trip. The children like the idea, make believe they're riding in a plane. In addition to a belt across his lap, Pop straps on a shoulder harness for long journeys.



Safety Belts Help You Drive

Strapped down, you're protected if a crash occurs. But that's not the only use for seat belts.

By E. F. Lindsley

DRIVING thrills are for those who like them, not me. Our two cars are just family transportation—to work, to schools, stores and visiting. We roll up about 25,000 miles each year, well over 800 hours in the driver's seat if you figure an average of 30 miles an hour. That's a lot of passing, a lot of quick stops, a lot of the close ones we all see and have in everyday driving.

When I take the kids out in our boat, I insist they wear life jackets. When I crawl to the top of a stepladder, I'm not too proud to ask someone to steady it. I wear

Installing an Aircraft Belt

goggles when I run the workshop grinder, and I carry flares in case my car stalls on the highway at night. I also like my seat belts. If the big brave guys think that's silly, they can go right on doing so.

It has been proved time and again that seat belts pay off in a crash. Every time a Navy pilot sets a hot fighter plane on a carrier deck and fetches up against the arresting gear, he demonstrates that the human body can absorb a sudden stop easily enough—if snugly tied to the machinery instead of smacking around like a bird in a glass cage. The same goes for seat belts in cars.

Driving is easier, too. Most of us never discover until we use a seat belt that it gives the "seat-of-the-pants" feel that fliers rely on. You know instantly what the car is doing. An impending skid, excess speed on a curve, the gentle (at first) hint of a tire going soft, all are communicated to your senses in a way hard to describe but deeply satisfying as a driving experience. Inevitably, this results in better control of the car. Women accused of driving mechanically without really sensing the "feel" of the huge weight under their hands will find that a taut seat belt gives them a feeling of belonging to the car.

The driver is not alone in the added comfort. My wife noticed at once that she didn't have to grab for the handgrip when

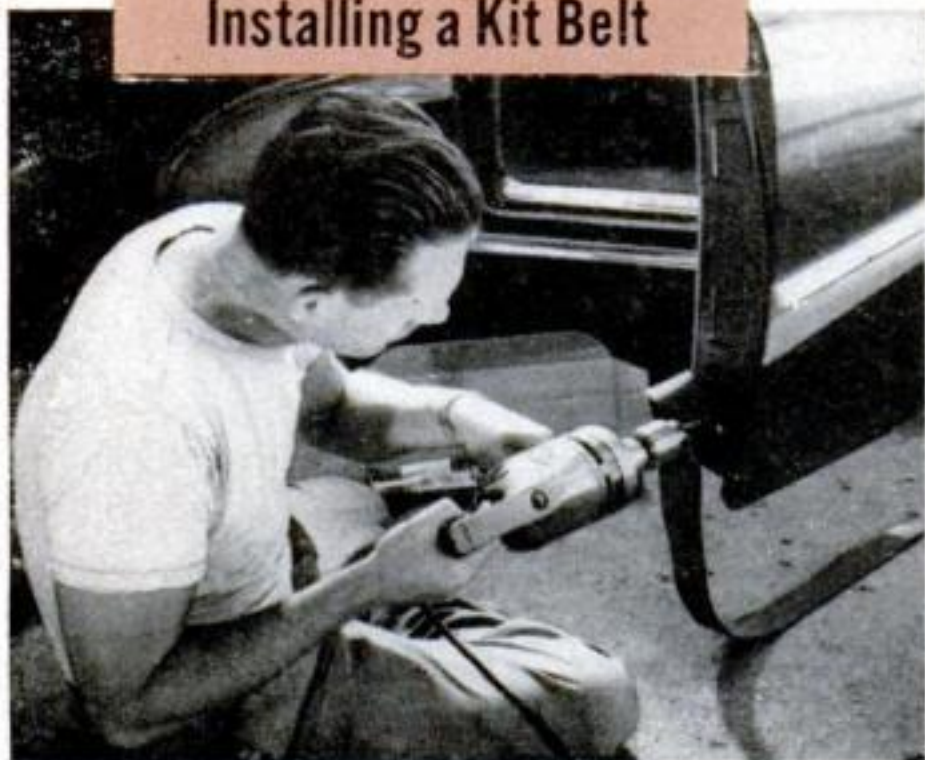


AIRCRAFT BELT can be used in small car or across one section of divided seat in larger one. You could adapt angle-iron anchor that writer used on Crosley to almost any car.

I took a sharp corner. Another joy for the family driver is seeing the kids stay put.

They must be strong. Seat belts may be called on to take a terrific load. For this reason, more than casual thought should be given to the materials used and how you install them. The most economical approach is probably the one I used on my wife's Crosley. Here, by plunking down about \$7 at the local airport supply shop, I got a replacement seat belt of approved webbing with a quick-release latch, adjustment clips and terminal connection fittings. Such a belt will easily span the entire seat of a small car. On a conventional-size car, it would do fine for one side of the front seat.

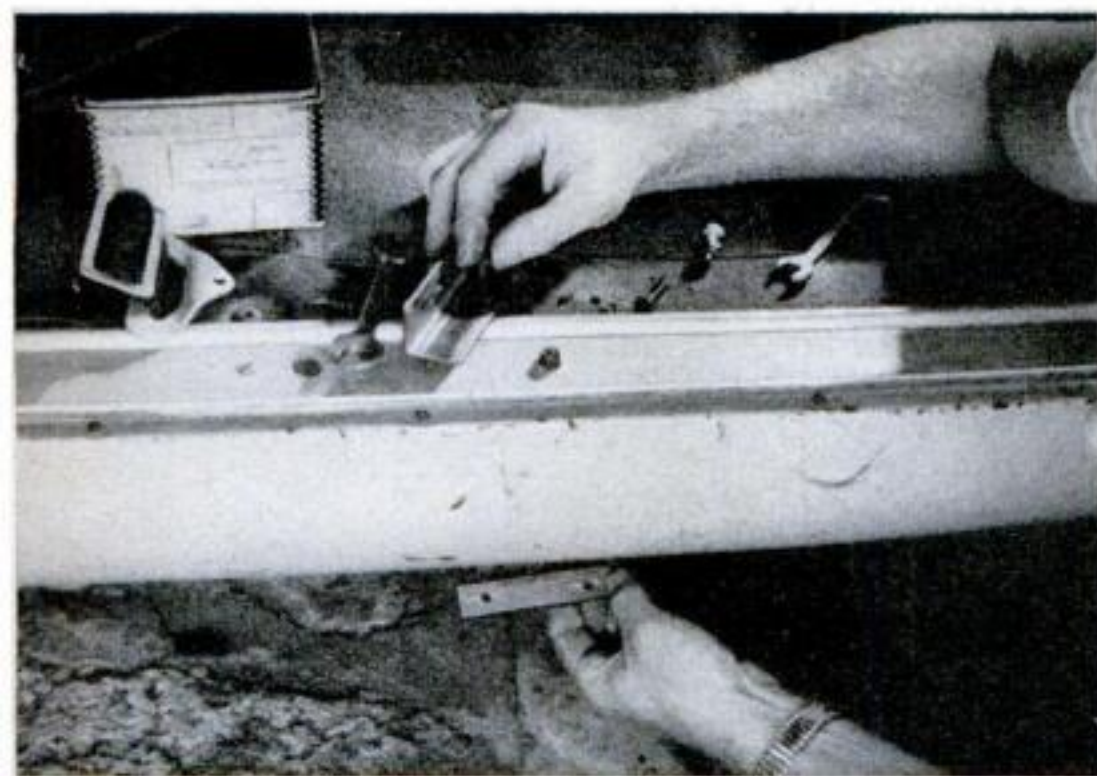
Installing a Kit Belt



SEAT-BELT KITS are available from several makers. Here, the writer is drilling edge of door to anchor belt he put on a Buick. Anchor there keeps door from flying open.



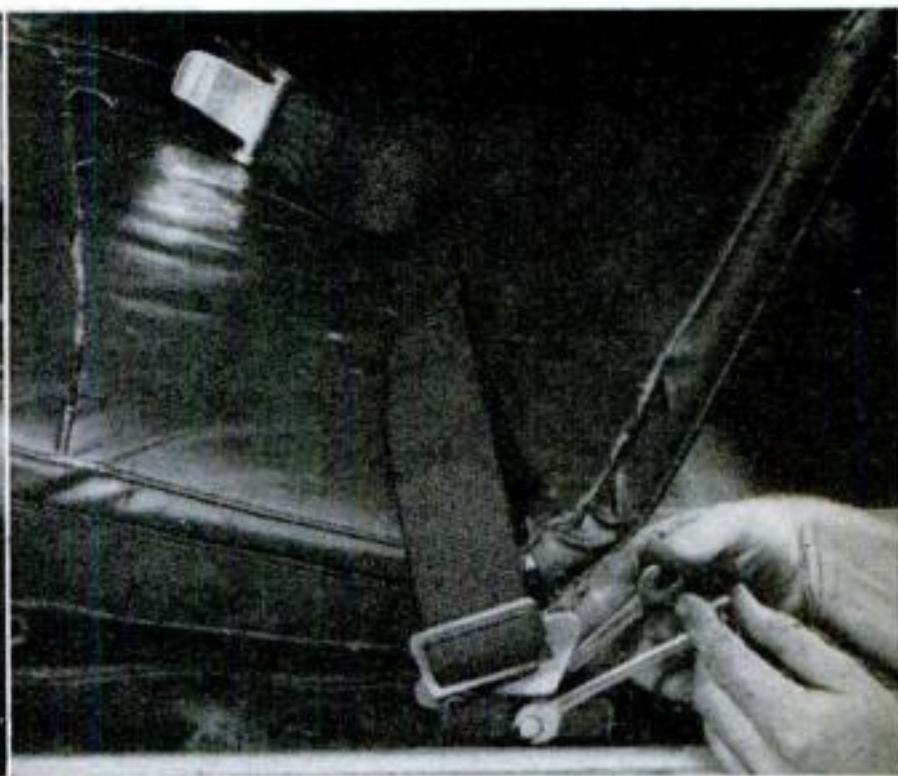
PLATED CLIP placed on door holds belt while not in use. Directions tell where to locate clip, but it's safer to probe with wire to be sure of hitting metal under fabric.



BOLTS with lock nuts or cotter pins are run through bottom panel and $\frac{1}{8}$ " reinforcing plate to secure anchor. Before drilling, check under floor for gas line or wires.

Anchor points at the floor level and to the rear on each side of the seat seem best for this type of installation. But the thin metal of the body bottom panel usually makes it necessary to use a piece of flat metal to beef up the anchor.

You can buy a kit. Getting around to belts for my Buick. I found that a commercial kit was available to fit. The one I used has an ingenious anchor scheme. By attaching one end of the belt to the lower rear edge of the door you get extra protection against that old bugaboo of the door flying open in an accident. When this happens, the car offers less protection because it loses structural strength. The center



BELT TERMINAL is aircraft fitting made for the job and secured with best-quality bolt and nut. One belt across both seats is good idea for mother who takes child along.

anchor for the front seat and the rear anchors at each end of the rear seat are sturdy U bolts with back-up plates. On a four-door car, the rear belts are attached much like those in front. The kit gives instructions and templates for locating the holes you must drill.

A shoulder harness, too. Impressed by the seat belts, I decided to try a shoulder harness on the driver's side. Some authorities claim a harness is all-important for the driver in a severe crash because of the steering column in front of him. I hope I'm never called upon to test the theory. Right now, when I pop into the car to run downtown, I snap on the seat belt and let the harness



CENTER ANCHOR POINT for inner halves of belt is off-center to driver's side. Right-hand belt thus can snug down two persons if three ride in front. Anchor is sturdy U bolt.



BELT FOR REAR SEAT also is held by U bolts and reinforcing steel plate. These anchors should be placed as far to rear as possible. The rear belt extends across entire seat.

Installing Shoulder Harness



SHOULDER HARNESS can be made from old parachute pack. By ripping away the excess, you have two strips of webbing and plenty of fittings for an adjustable harness. No sewing

go. Out on the highway on a trip with the speedometer needle swinging toward 65, the harness is on.

Nose around some of the stock-car races and you'll see a variety of harnesses and methods of anchoring.

Searching around a few airports brought to light an average back-pack parachute (minus silk) which the owner cheerfully unloaded for a couple of bucks. An hour with a sharp knife unsewing the mess brought me all the soft shoulder webbing I needed, plus a hatful of snaps and tight-cuing keepers. Anyone wanting a shoulder harness should make a quick circuit of the airports and war-surplus stores.

The installation was a snap. Two holes, a husky U bolt centered aft of the driver's seat with both ends of both straps clipped to it and I had a first-rate shoulder harness. I didn't do a thing to the snap and pad that go across the chest except cut off the ripcord housing. The snap slides up or down as you like it and keeps the straps comfortably across your shoulders where they belong.

Disadvantages. The greatest disadvantage of seat belts and a harness is inconvenience. They can't help you if you don't put them on. They help most if they are reasonably snug. When they are snug it's hard to fish your tobacco pouch or wallet out of your hip pocket. If you let them get dusty you may wind up with a stripe across



is required. Ripcord housing should be cut off and the padded front clasp used without change. The snaps for leg straps are used for attaching harness to anchor behind seat.



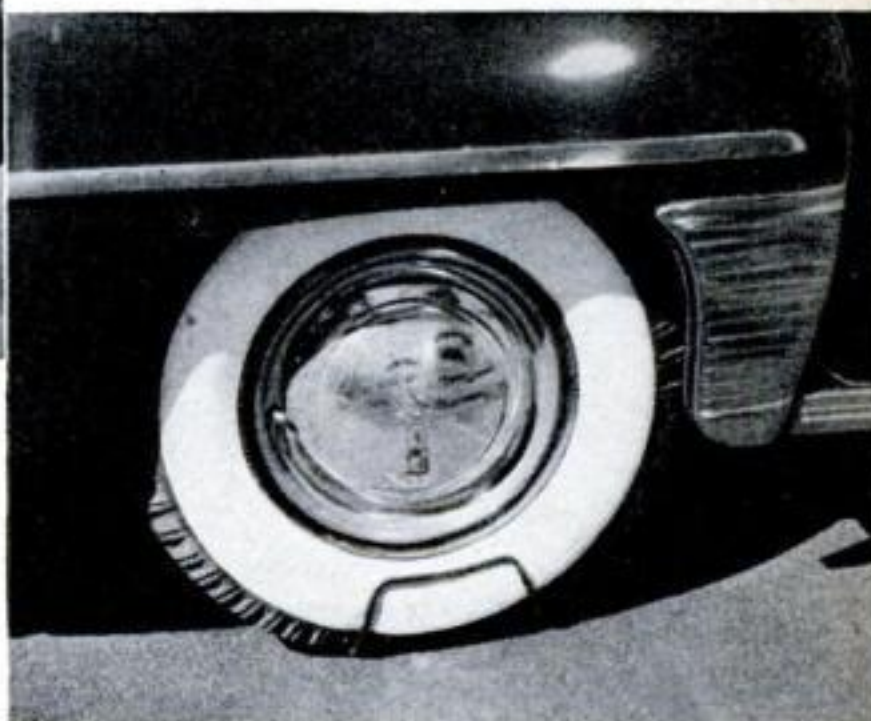
TWO STRAPS run over and under the folding back rest, ends attaching to U bolt in floor. On a four-door car, the fabric at seat fold would have to be pierced for straps.

your trousers. Also, the kind of guy that laughs at a drunken driver and smokes while pouring gas in an outboard may needle you about being a scared Willy. But I don't care. Seat belts make sense to me. **END**

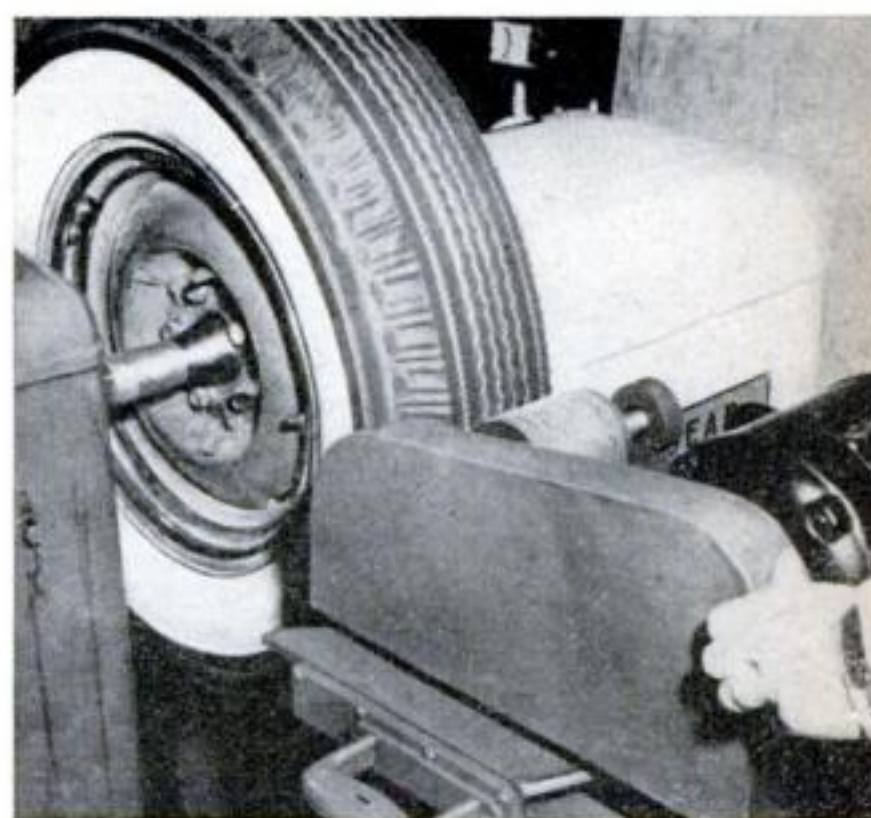
News from Auto Row



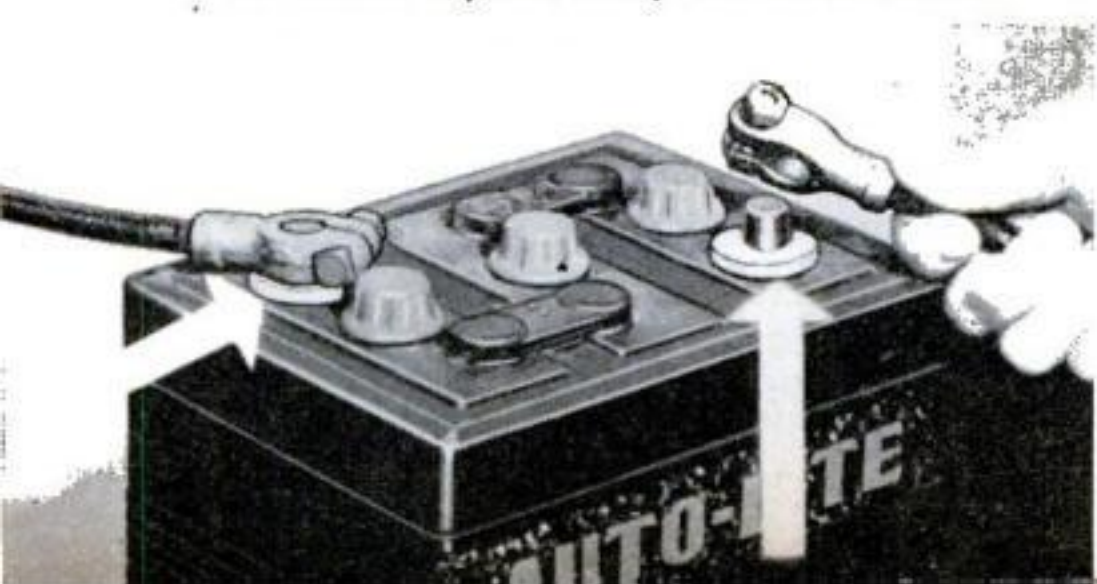
1. Traction Clips Put Themselves On. If you're stuck in snow, you can put on these emergency traction clips without moving the car or jacking it up. The spring-wire clips are pressed against the tire (above), and slight rocking or spinning of the wheels will draw them tightly on (right).



2. Pump Heats Parked Car. You can park your car, stop the engine and still keep warm with this auxiliary electric pump. Connected in the heater's water line, the pump will circulate stored-up heat after the engine is shut off until the water temperature falls below 85° F. Then a thermostatic switch turns the pump off.



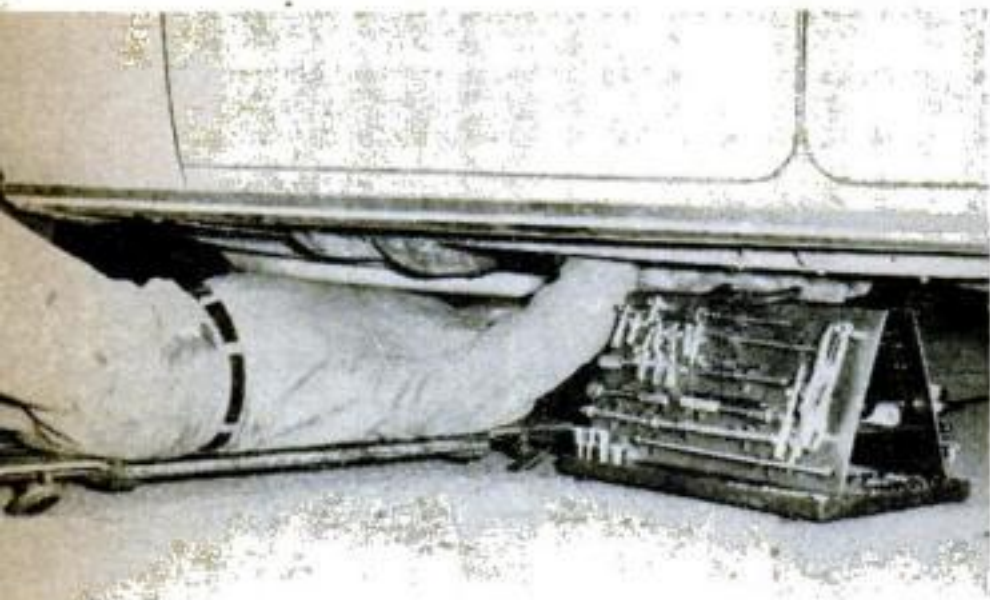
3. Washers to Stop Battery Corrosion. Slipped over the terminals of a car battery, these chemically impregnated washers are said to eliminate corrosion that steals power and shortens battery life. The washers last for about a year. They are color-coded.



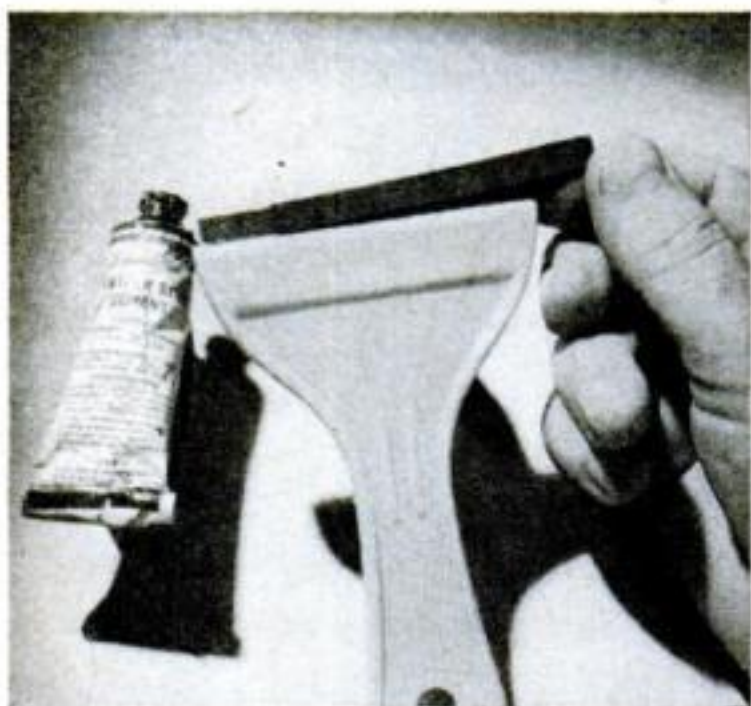
4. Machine Smooths Bumpy Tires. Since no amount of balancing can cure a tire that's slightly out of round, this new machine first makes sure the tire is perfectly true. The wheel is rotated against a gauge that detects high spots, then the bumps are smoothed down with the grinding drum above. The wheel is then balanced on the same machine, enabling all operations to be done in a few minutes without removing and recentering the wheel.

**Please turn the page
for more News from Auto Row.**

More News from Auto Row

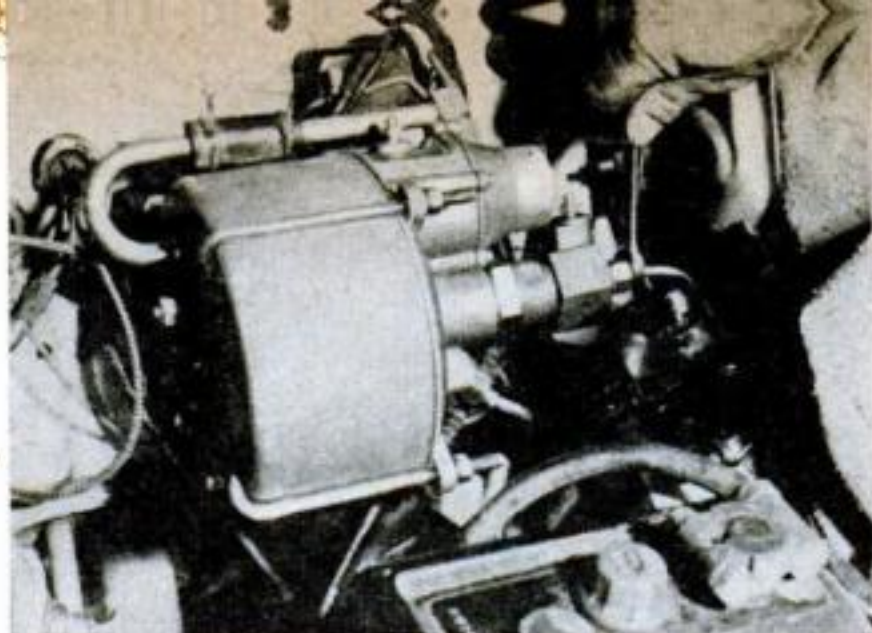


5. Tools Clip to Rack. You can make up any arrangement of tools you want on this clip-on rack and have them within easy reach when working in tight places. The tools are held in spring clips that can be screwed into holes anywhere on the perforated sides of the rack.



Ice Scraper Is Squeegee

CEMENT a rubber strip to your plastic windshield scraper. Then after you get the ice off you can turn the blade over and squeegee away the slush. Cut the rubber strip from an old inner tube and cement it with weatherstrip adhesive.—Ken Murray, Colon, Mich.

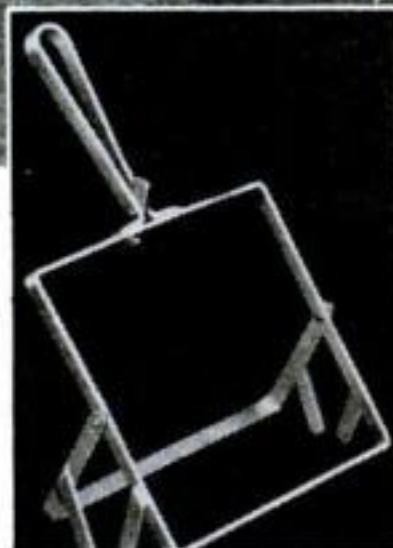


6. Kit Adds Power Brakes. Almost any car made since the war can have power brakes with this accessory kit. It consists of a vacuum-operated booster unit (above) that hooks to the regular hydraulic braking system. Adapters fit most cars.



7. Tool Spreads Tire Casing.

Steel fingers on this lever-action spreader grip the walls of a tire and force them apart for easy access to the inside of the casing. The tool's frame gives a 10"-square open working area. A safety catch keeps it from accidentally springing closed.



1. Atlas Supply Co., 714 Broad Street, Newark 2, N. J.; 2. Heat Circulator Co., 6017 E. 57th, Seattle 5, Wash.; 3. Racine Specialty Mfg. Co., 1309 State St., Racine, Wis.; 4. Bear Mfg. Co., Rock Island, Ill.; 5. Nuttle, Inc., 123 E. Third Street, Joplin, Mo.; 6. Bendix Aviation Corp., South Bend, Ind.; 7. Lummis Mfg. Co., 2242 East Foothill Blvd., Pasadena 8, Calif.



COLLAPSIBLE DRINKING CUP (above) shows principle of interlocking rings that makes a wood disk balloon into a bowl. Rings are jigsawed at angle, coated with glue, then drawn out until wedged (below).

How to Turn a Flat Board into a Bowl of Wood

By cutting interlocking rings from a flat board, you can draw them out—like a drinking cup—into many fancy shapes.

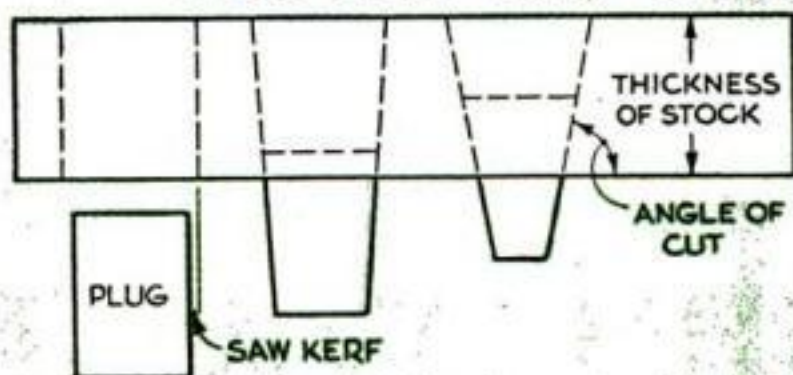
By Edwin M. Love

YOU can change a single flat board into a shapely bowl by sawing it in pieces. Sounds like magic, maybe, but the only trick about it is in the way that you do the cutting.

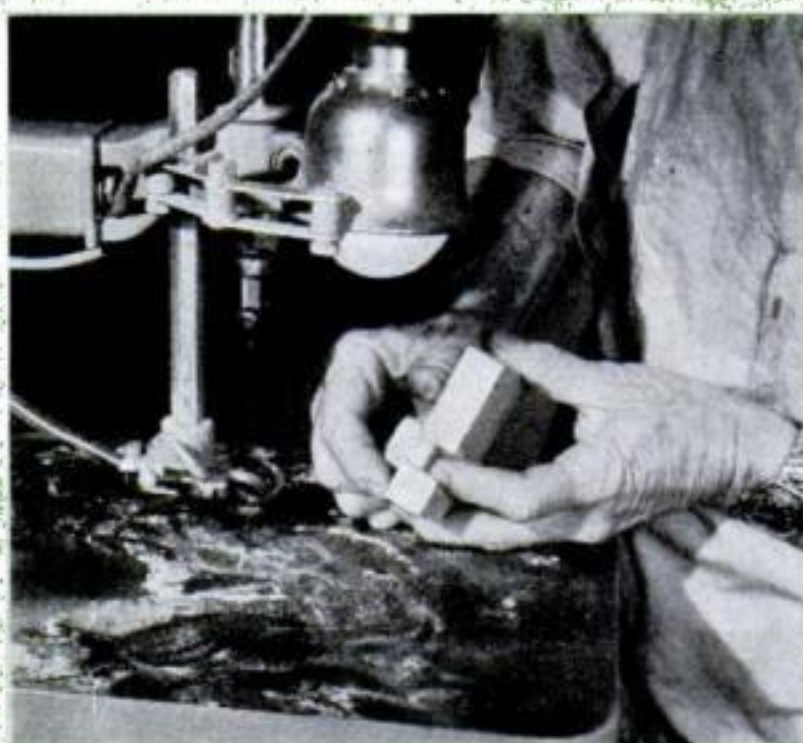
You jigsaw the board into a series of

concentric rings, but instead of cutting vertically, which would let the rings fall through each other, you tilt the saw table so that the blade makes a slanting cut, tapering the edges. Each ring then falls only part way through, wedging itself tightly inside the next-larger one. Draw the rings out and they literally balloon into a rigid,

HOW SAW AND WOOD LET YOU VARY THE LIFTS



JIGSAWING AT ANGLE produces tapered plug that wedges in tapered hole, projecting part way through (right). Angle of cut, width of kerf and wood thickness determine amount plug (or lift ring) will protrude (sketch). Thin stock is impractical because kerf lets ring fall through, whatever angle of cut. A good thickness is $\frac{3}{4}$ ". Trial cuts will show tilt for desired projection—usually half wood's thickness.

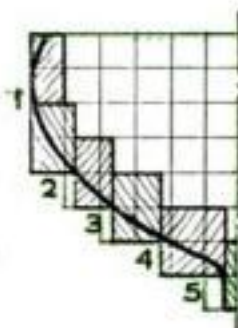
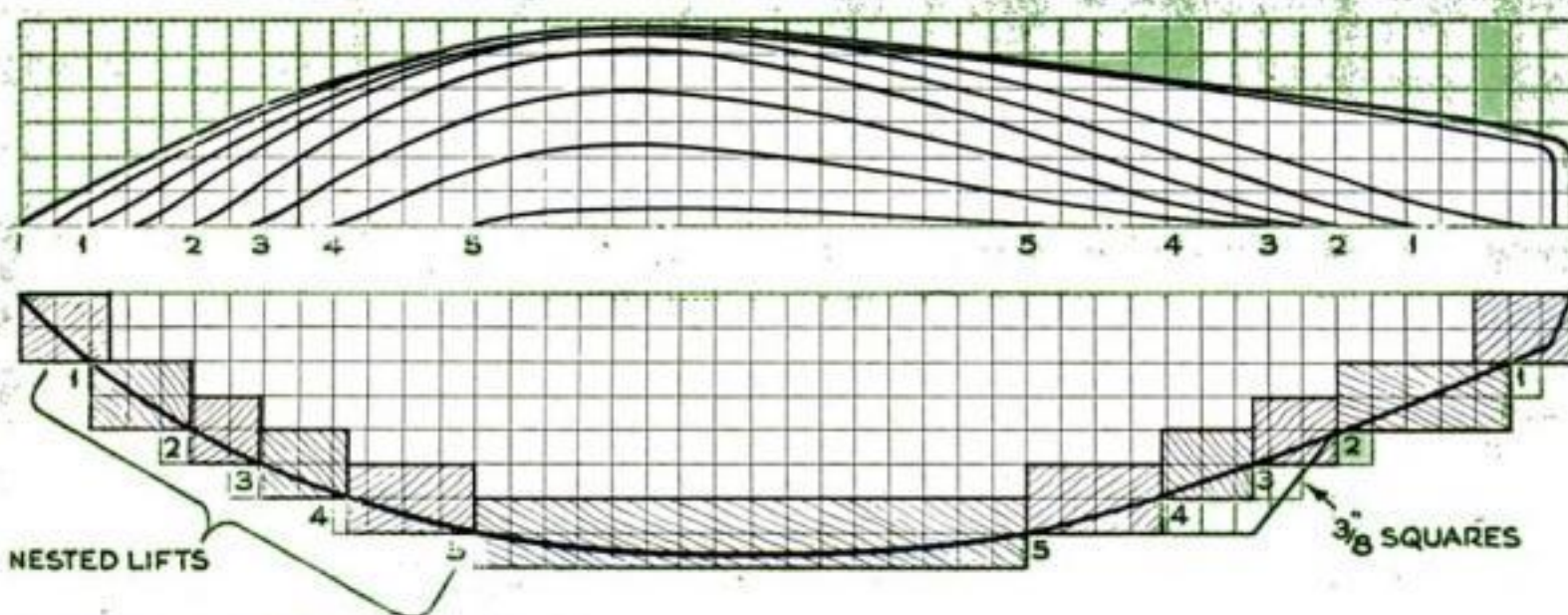


three-dimensional object that can have any shape you want to give it.

The technique, called lift sawing, can be used to form bowls, vases, ship hulls, relief maps—any shape that can be built up in tiers. The tiers can then be turned down on a lathe, forming a single, smooth-flowing

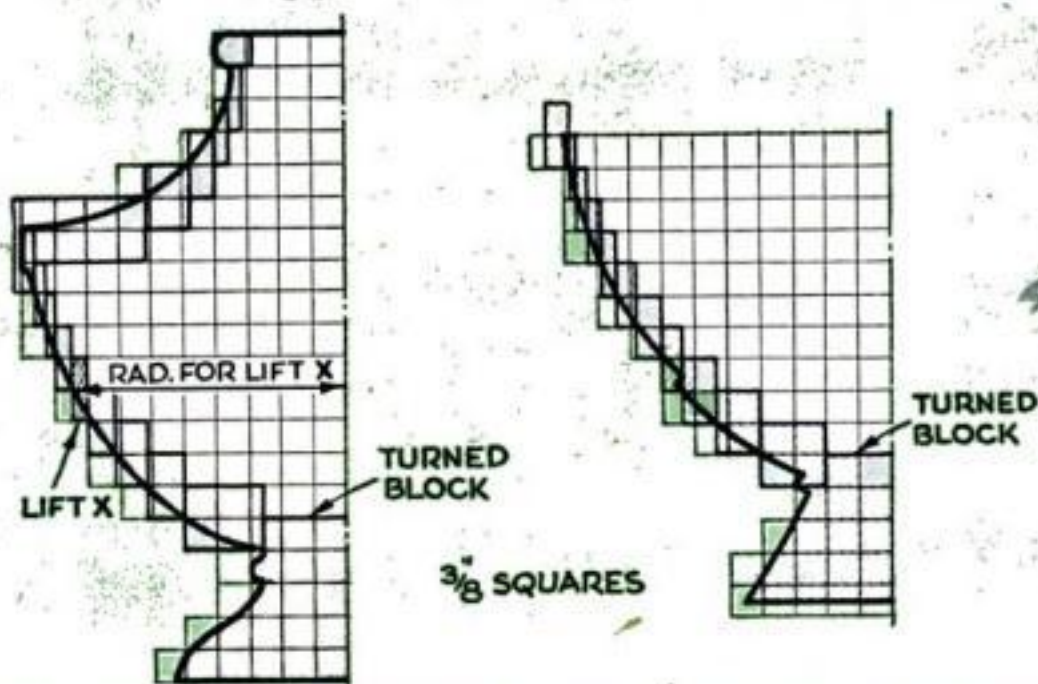
contour, or left exposed for a stepped effect. Because the rings are all cut from the same board, they save wood. Careful work also assures a perfect matching fit, providing accurate contours. And because they're hollow, they automatically form a hollowed-out shape that saves hours of finishing work.

USE LIFT SAWING FOR MODEL-BOAT HULLS



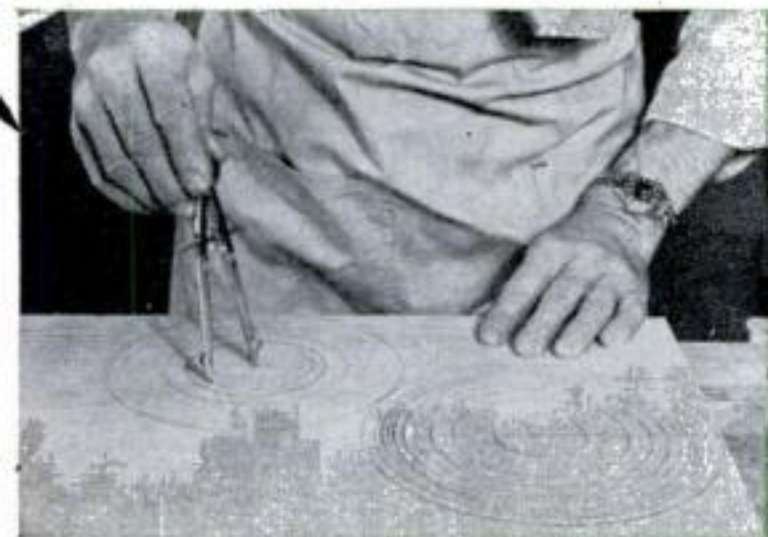
BOAT HULLS are ideal lift projects since rings automatically form lightweight, hollow hulls that need no further chiseling out. Lifts are made as shown in the above plan, which can be scaled up or down to any desired size. Cardboard templates cut to fit various stations along hull will insure accurate shaping of both sides. Use waterproof glue in putting lifts together.

SINGLE BOARDS BALLOON INTO BOWLS AND VASES



VASE AND BOWL you can make are shown laid out on $\frac{3}{8}$ " squares. Radiuses for rings are found by measuring distance between center-line and point where the middle of each lift

thickness intersects the profile line. Vase needs one set of lifts for body, another for neck. At right, finished vase has drinking glass that fits inside neck to hold flowers.



CIRCLES ARE LAID OUT with compass after radiuses of rings have been determined from scaled profile. Radius line, intersecting circles, provides register points so rings can later be assembled in same positions they were sawed.



DRILL STARTING HOLES for jig-saw blade at same angle as for sawing. Make several holes in row, then punch out waste with knife to form slot for wide saber blade. Small nail clipped off square makes handy drill that won't drift.



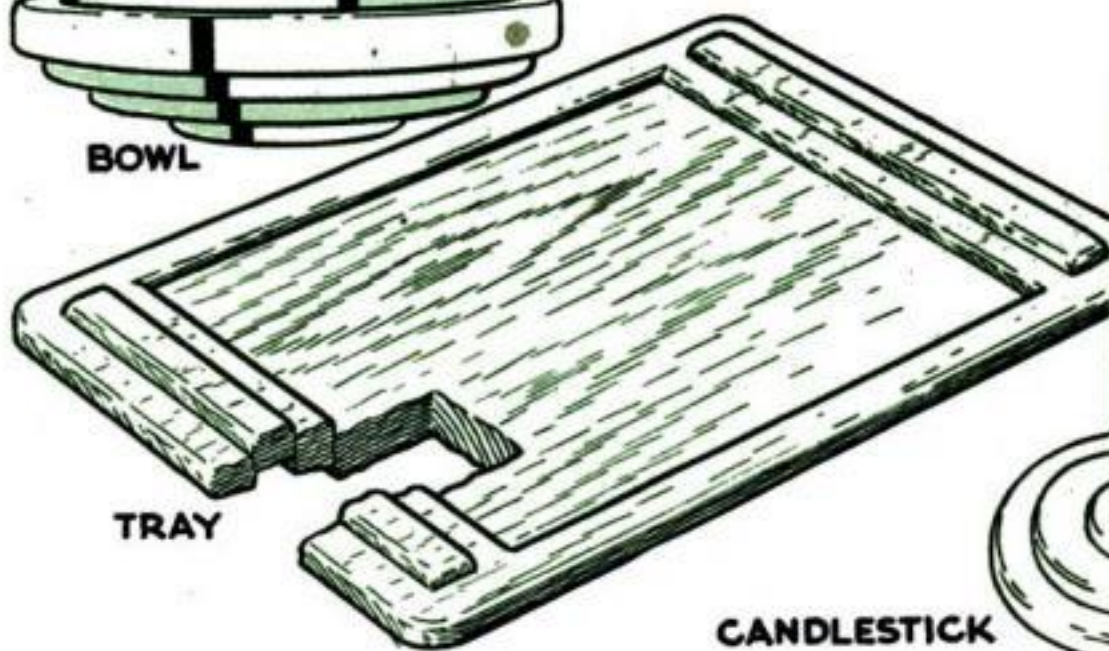
VASE IS TURNED at slow speed, using lift joints as guides for shaping contours. Remove waste down to each glue line and desired shape will result. Solid top lift engages lathe, is cut out later.

STEPPED PROJECTS ARE EASIEST TO MAKE

STEPPED PROJECTS like this bowl and candlestick are easy to make by simply allowing lifts to remain exposed instead of turning them down on lathe. Tray has a double, reversed lift—bottom is recessed while endpieces are raised to make handholds underneath. Edges of all lifts should be slightly rounded and sanded smooth. **END**



BOWL



TRAY



CANDLESTICK



Box-Camera Wizard Snaps Famous People

John J. Loughlin won't touch anything more complicated than a flash Brownie—but his pictures rival the pros'.

By Dave Stanley

SOME of the nation's most professional-looking flash pictures are being taken today by a mild-mannered amateur photographer who gets extraordinarily fine results with an ordinary box camera. His name is John J. Loughlin, and with his trusty one-bulb flash and an inexpensive \$11.95 Brownie he's won the gold-spangled accolades of the photography world. His two-and-a-half-room apartment in Manhattan is as crowded as a well-stocked camera store with prizes, citations, merit awards and mementos of exhibitions.

Loughlin revels in his camera equipment. Since the day almost 30 years ago when he bought a one-buck box in Troy, N. Y., his only concession to change was in 1946 when he discovered flash. Then he bought himself another box camera with flash synchronization. Now he's surprising the experts with striking candids, night outdoor shots, and "at home" scenes. Particularly outstanding are his portraits of celebrities, including Presidents of the United States, top scientists, Pulitzer Prize winners, sports idols, diplomats, Broadway and TV stars—all shot on the run.

Loughlin is one of the hundreds of thousands of home-loving hobbyists whose hearts have been captured by the tiny flash bulbs. Once almost the exclusive tool of news photographers who wanted to capture spot news, today they are used everywhere. Reason? "Flash is sunlight at your beck and call. You can shoot indoors without expensive and bulky equipment," says Loughlin. "And without pushing the furniture. You just click the clicker and that's all."

The New York box-camera enthusiast swears by flash, which has revolutionized photography as 3-D has Hollywood. Flash was introduced in 1930, but sold poorly. Today, according to U. S. Department of Commerce figures, photoflash-bulb production is a whopping big business with more than 339,000,000 units (worth 49 million dollars) produced in 1952. Not only that, flash-designed cameras are leading the popularity polls. Sixteen million were sold in 1952—more than 85 percent of all cameras sold that year. Eastman Kodak recently announced: "Practically all cameras produced by us at the present time are designed for use with flash."

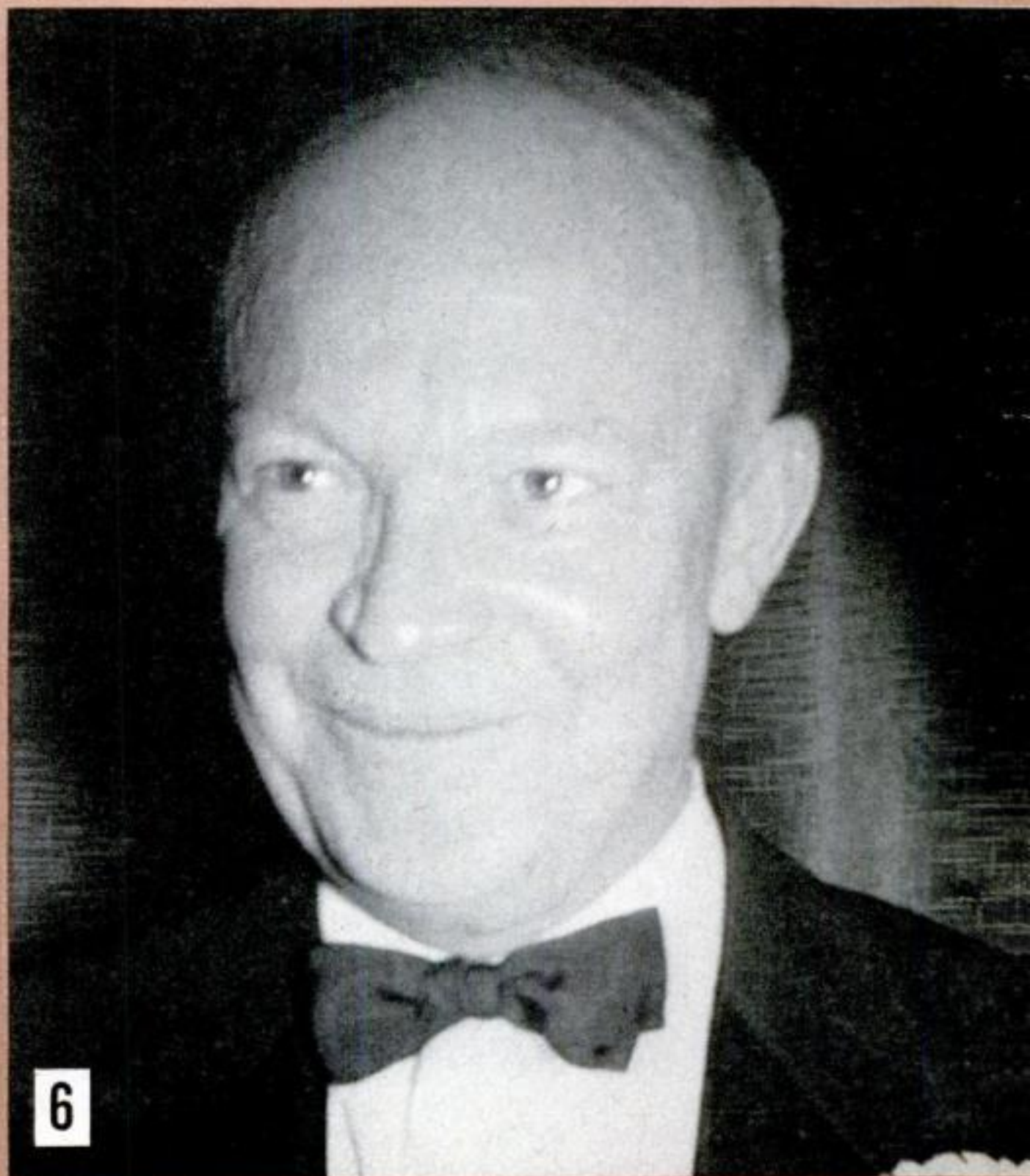
No, Mr. Loughlin is not alone. But what's his special camera magic? You might say



Here Are Some of Loughlin's Celebrities

HOW MANY DO YOU KNOW?

(See their names at the bottom of the page.)



Answers: 1. General of the Army Omar Bradley; 2. New York City's Mayor Vincent R. Impellitteri; 3. Champion Golfer Ben Hogan; 4. Poet-Historian Carl Sandburg; 5. Movie-TV Star Jimmy Durante; 6. President Dwight D. Eisenhower.

that he knows the capabilities of flash, the reaction of flash to different lights, shadows and textures. But he says simply: "Seven years of practice."

Take the national pastime: shooting babies with flash. Loughlin clucks sadly at the way many photographers make the mistake of shooting babies dressed in white. "When flash hits all that white," he says, "you get distortion and you lose the baby's features. Best thing to do is to use color in the baby's dress and blankets. This brings forward the baby's features."

On dog pictures, he warns: "Shooting a good portrait of your favorite dog requires a lot of care. No matter how much the dog loves you, chances are that he'll let you take only one flash picture. So make your first picture count."

A dazzling array of flash techniques—multiple flash, flash with extension cord, flash as back light—have been developed. Loughlin takes the unorthodox, simplest, low-cost road. He shoots with one bulb (Press 40) atop his box camera. That's all. Not finicky, he shoots his celebrity portraits very quickly. "I shoot and am away while most of the photographers are still fussing around."

Celebrities Are His Specialty

When the box-camera enthusiast is on the trail of a celebrity, he is as relentless as a Georgia police dog. He uses the phone, letters, intermediaries—even surprise. He's caught President Eisenhower at a private New York dinner, Adlai Stevenson in the lobby of the Hotel Roosevelt, Ben Hogan at a bulb-popping press conference at the U.S. Golf Assn., Pearl Buck in her car, Supreme Court Justice William O. Douglas outside New York's Community Church, Harold Lloyd on the ramp of the Hotel Commodore, Mme. Pandit of India at a party at the Waldorf-Astoria, and Bernard Baruch—where else?—on a bench one Sunday morning in Central Park.

The FBI even helped him get one of his best pictures, a portrait of Jimmy Durante. Through a friend he ambushed

Durante, who was entertaining at a private FBI dinner. Loughlin got a wonderful shot of Durante's mug, but the portrait got as much circulation as a lie detector at a liars' convention. The picture got onto the front page of probably the world's most secretive house organ, the G men's own *Grape-Vine*.

They Autograph in Advance

Loughlin is always on the alert to add to his portrait collection, which now numbers 72. Not long ago, he got wind that Carl Sandburg, the Pulitzer Prize-winning biographer of Lincoln, would be in New York. He was especially interested in shooting Sandburg, for Loughlin has a fine collection

of photographic Lincolniana. After much phoning, he finally got to Sandburg at his publishers' offices. "I took one picture of Mr. Sandburg at a desk, and another of him looking at one of my Lincoln photographs, and in two minutes I was out," Loughlin recalled. One of Loughlin's best portraits, it caught the author's peculiar

down-the-middle part, the short cowlick.

The "Wizard of the Box Camera"—as he was once tagged at a show—gets the celebrities to autograph the portraits with a neat trick. "When I'm going to take a picture, I carry along an empty picture mounting, and they sign on the bottom."

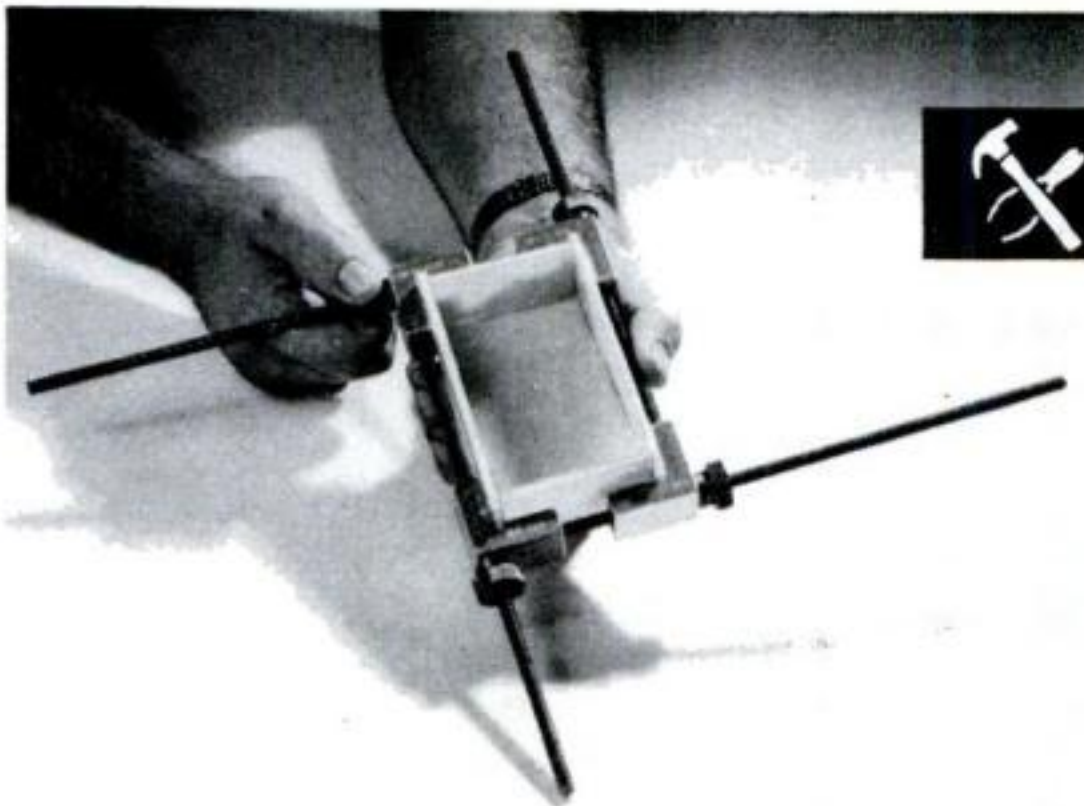
Though an unpaid press agent for the box camera, Loughlin is not blind to its limitations. "You can't shoot fast action because of the box camera's shutter speed of 1/25 or 1/50 second," he says.

"One of my best shots made with flash and box camera was taken outside Child's about seven o'clock in the evening. There was a girl doing a chef-in-the-window thing, making flapjacks. Well, I studied her for a while and watched her toss them in the air. I figured out the exact point when her arm started to come up. Then I shot, and got a wonderful picture of her flipping the golden brown flapjacks in mid-air! I shot the picture, of course, through the window. What a shot! I still get hungry every time I look at it."

Workshop Wisdom



*I'll climb down much faster, thought
Hadder
By facing away from the ladder.
He thought he was hep,
But one foot missed a step
And he landed ahead of his shadder.*

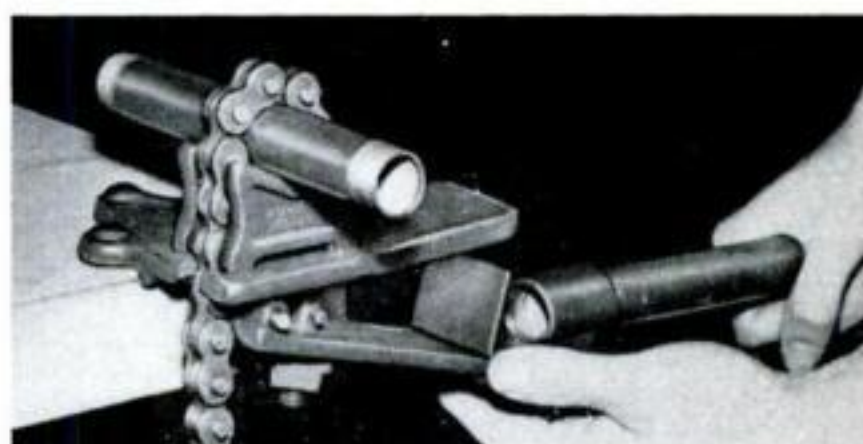


New Tools

1. Threaded Rods Clamp Frames. Entire frames or boxes can be clamped square in this four-cornered gluing rig. Aluminum corner blocks are drawn up tight by thumb nuts on long threaded rods. Holes in the blocks permit nailing. Four sizes give maximum openings of 8", 12", 18" and 24".



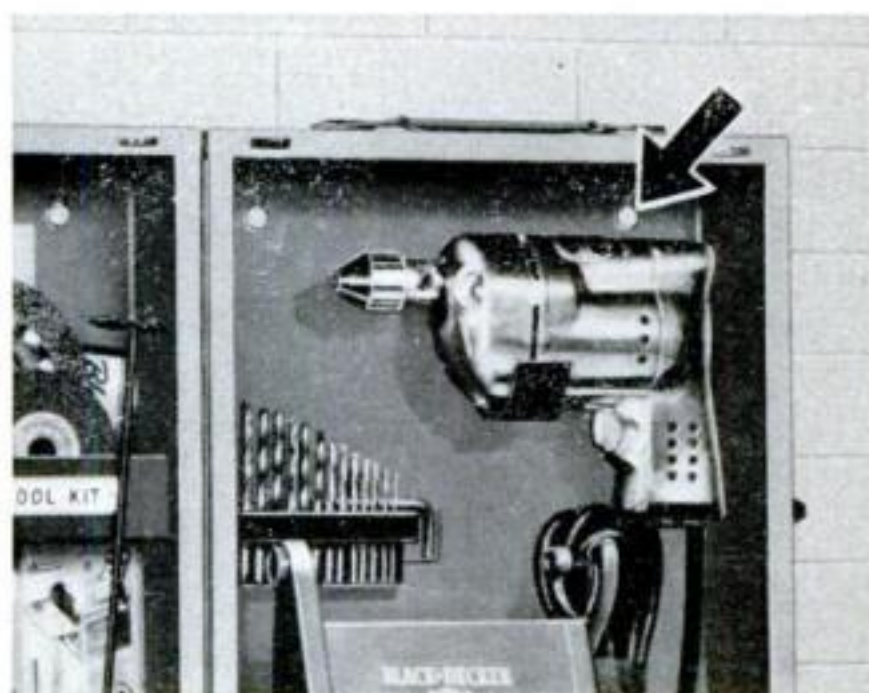
2. Pliers Do Four Jobs. The tips of these wireworking pliers crimp solderless lugs on wire with a single squeeze (above). Behind the tips are five threaded holes into which machine screws can be turned, then sheared off without damage to the threads. Along the handle are a wire cutter and six slots for stripping insulation.



3. Ratchet Locks Pipe Vise. You don't have to tighten any screws in setting up this chain-type pipe vise. Once the handle has pulled the chain tight, a sliding ratchet is simply slid along the handle until it wedges it down, locking the chain. Two models are available, one for pipe up to 2½", the other for sizes to 4".



4. Holder Speeds Nailing. You hit the nail and not your fingers with this holder. It has a grooved magnet at the tip. The holder alone is a tack hammer.



5. Drill Kit Hangs Up. Just knock out removable inserts in the back of this drill kit and you can hang the entire metal cabinet on the workshop wall.

Further information can be obtained from: 1. Cincinnati Tool Co., Cincinnati; 2. Aircraft Machine Products, Harrisburg, Pa.; 3. Springload Mfg. Corp., 9 S. Clinton, Chicago; 4. Hunter Tool Co., Box 7395, Lugo Station, Los Angeles; 5. Black & Decker Mfg. Co., Towson, Md.

Two Work Supports for Your Power Saw

One has wood rollers, the other ball bearings to carry the stock. Build the one of your choice.

WHEN you're sawing unwieldy stock, outboard work supports are better than people. They won't ever tire, move the work unexpectedly, or leave when most needed.

Roller stand. The husky support on the facing page will handle long planks, wide boards or plywood panels with equal ease. The rollers can be gang-turned on a wood lathe. Centerdrill them $5/16"$. Sand $5/16"$ dowel to an easy fit in the holes, cut $2\frac{1}{4}"$ pieces, and dip in hot paraffin.

Tack the four rails together and drill holes (a tight fit for the dowels) through all of them at once. Pull the rails apart and assemble with the legs as spacers, cutting

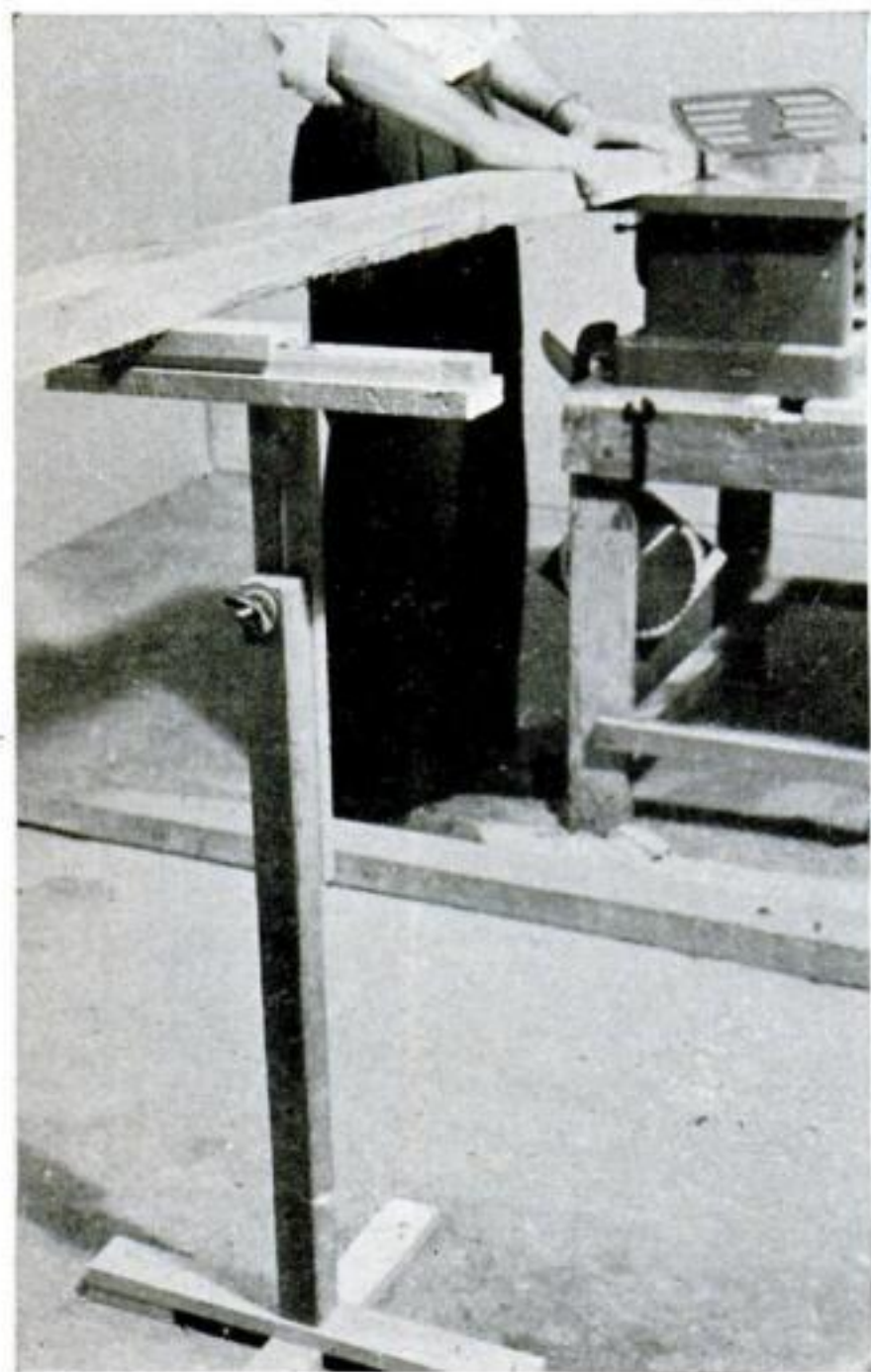
these $\frac{1}{2}"$ shorter than the height of your saw table above the floor. Screw iron angle braces inside the stretcher and end blocks.—*Stanley Roberts, Los Angeles*

Ball-bearing support. Useful chiefly for crosscutting, the stand below will enable you to square long, heavy boards easily.

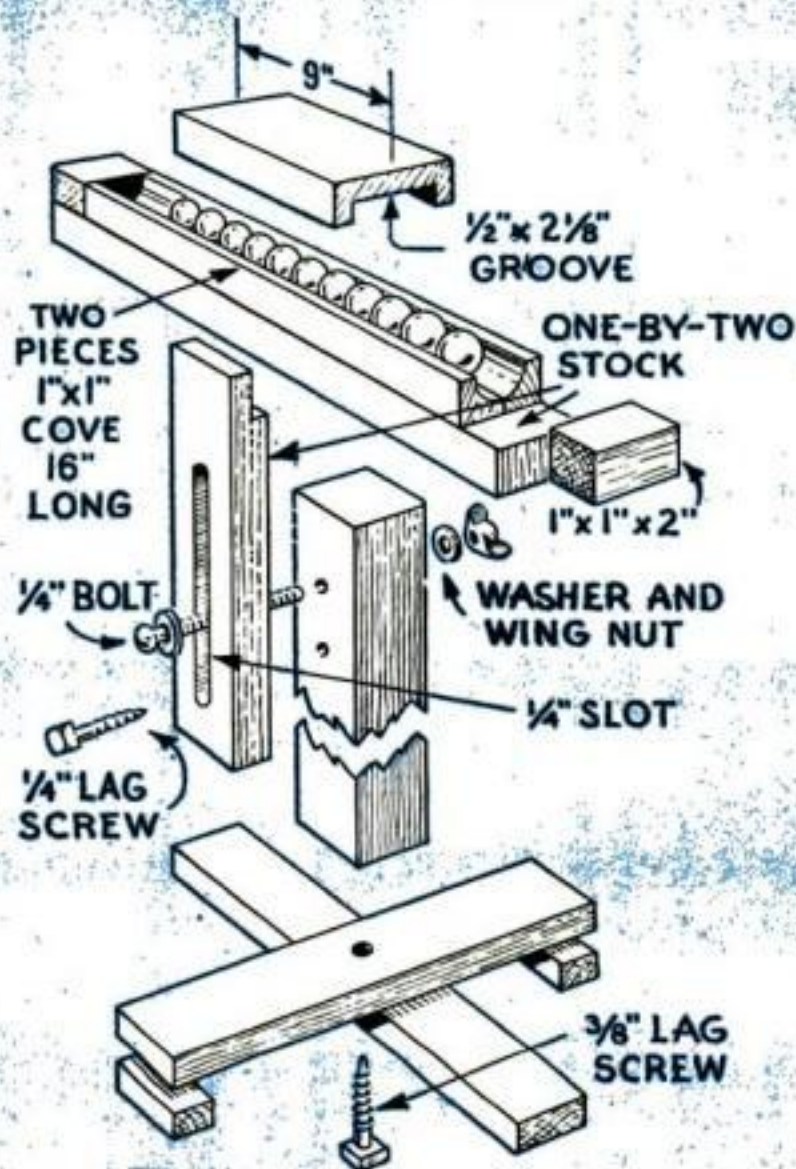
The work rolls on $\frac{3}{8}"$ glass marbles that serve as ball bearings. These are placed in a trough made of standard cove molding. Tack two lengths to an 18" one-by-two and close the trough with a block at each end.

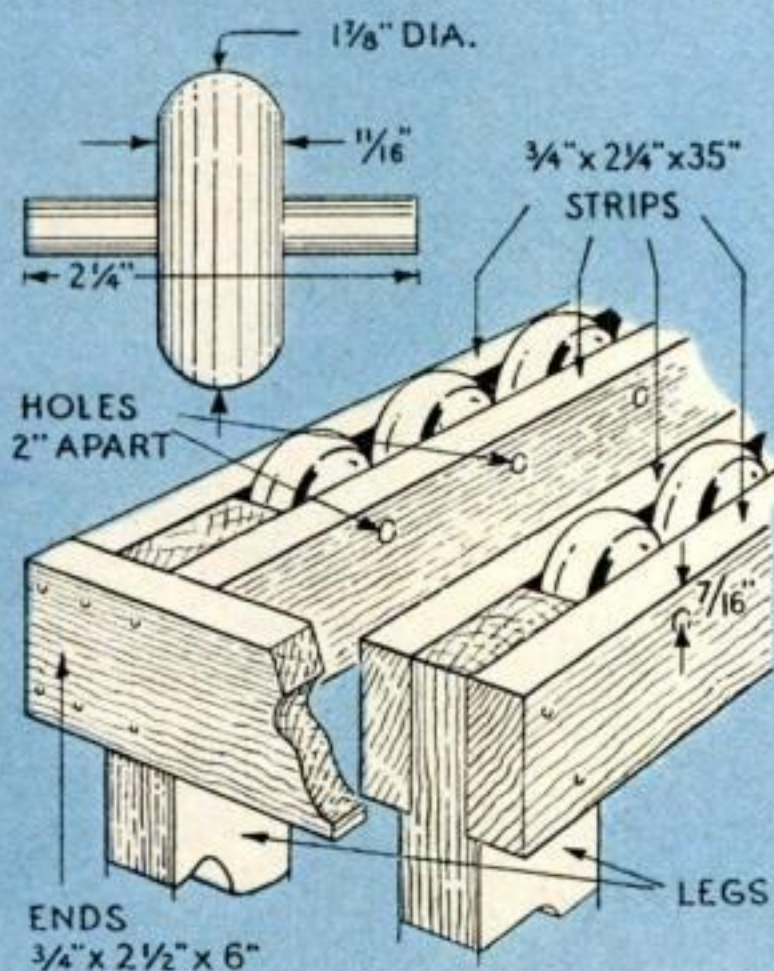
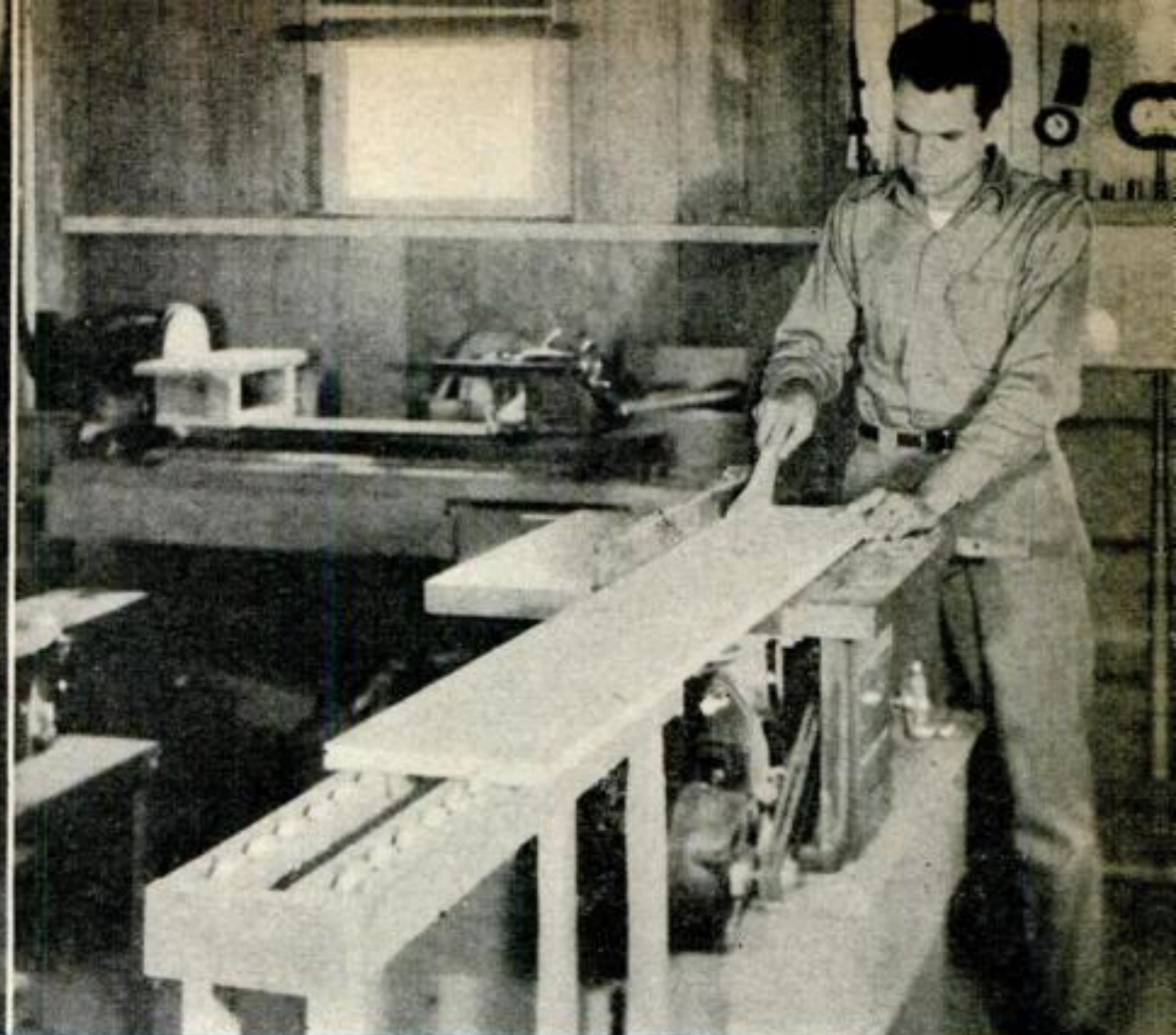
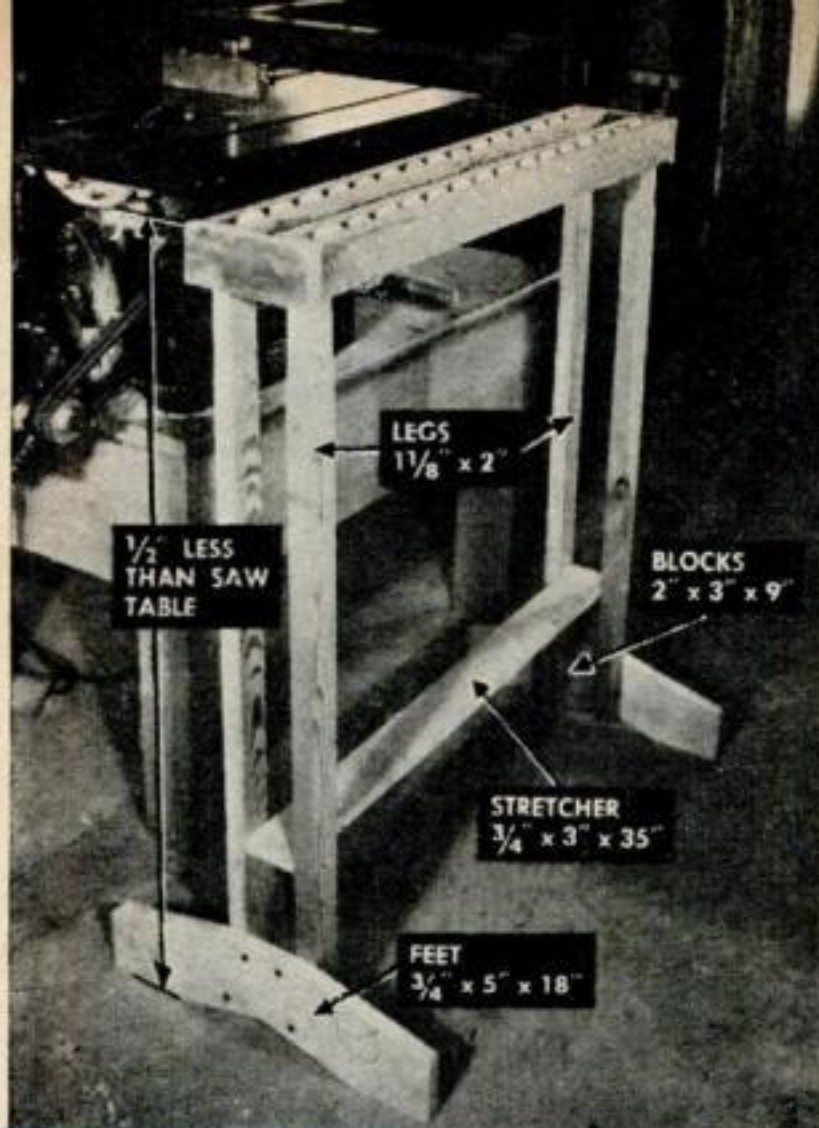
Cut a smooth-bottomed groove in a 9" piece of one-by-three to make the slide, or build it up by nailing two pieces to a third. Use 12 to 15 marbles of uniform size.

Make the base upright 8" shorter than saw-table height. A small lag screw below the clamping bolt prevents the head from turning.—*Frank M. Butrick Jr., Alma, Mich.*



WORK ROLLS on ball bearings (marbles) in this crosscutting support. Here a 12' hard-maple two-by-four is being trimmed square. Top of slide is set level with saw table.





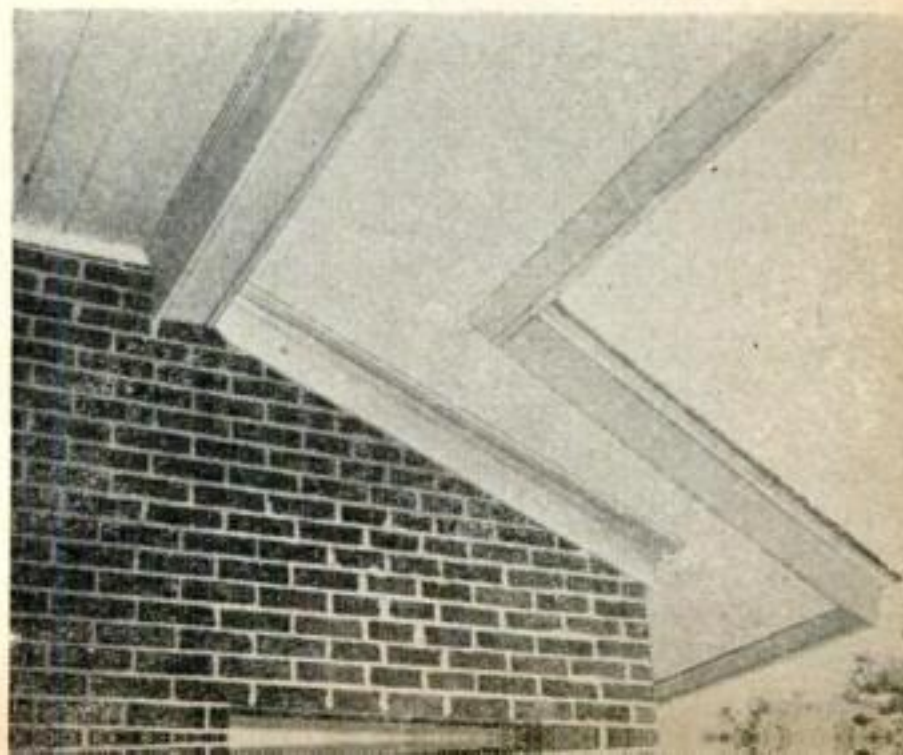
ROLLERS SUPPORT STOCK its full length for ripping. With the stand located directly behind the saw table, overhanging work rolls smoothly and has no tendency to tilt or slide away from the fence.

TURN DOWN 2\" oak or maple $1\frac{7}{8}$ \" diameter, mark at $\frac{7}{8}$ \" intervals and turn all the rollers at once. Saw apart to $\frac{13}{16}$ \" thickness. Mount a scrap block on lathe faceplate. Bore to a push fit for rollers. Insert each and run through a $\frac{5}{16}$ \" drill held in the tailstock chuck.



Eaves Ventilate Roof

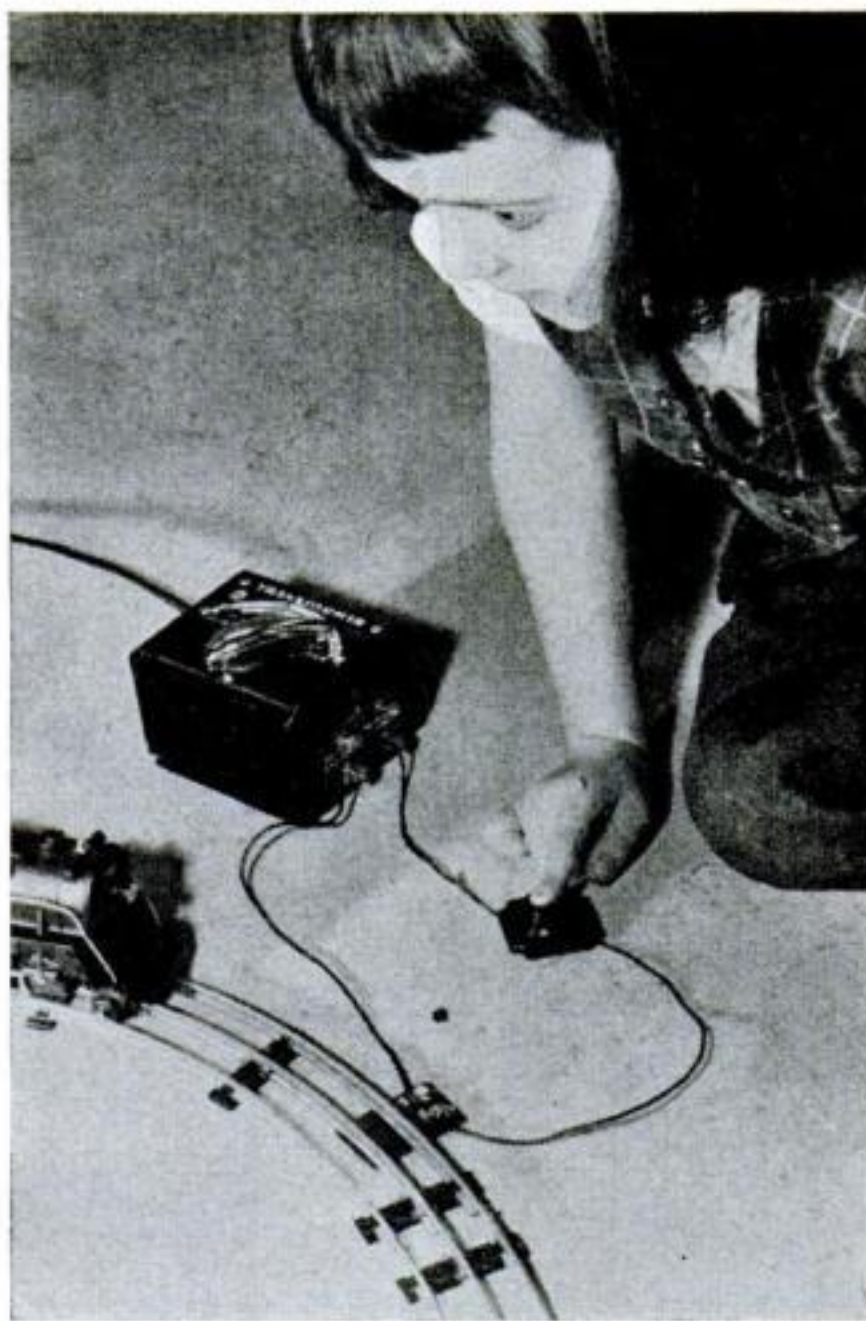
A QUICK-AND-EASY way to provide under-eaves vents—needed in many homes to cool the roof or prevent condensation—was worked out by J. D. Johnson, Tallahassee, Fla., contractor. He stapled screening directly to the framing and then simply covered the screening with perforated panels of $\frac{1}{4}$ \" Peg-Board Masonite. This takes less time, he reports, than setting in the usual framed-screen vents.



Push Button Controls Toy Train and Stops It Automatically

HERE'S an easy way to make sure small fry don't dash off leaving an electric train running. Connect an ordinary push button in series with the feeder wire to the track. It not only saves current and wear and tear on the trains, but prevents a dangerous short from going unnoticed in an unattended closed circuit.

Several buttons in parallel will provide controls at different points around the track. —Karl Greif, Vestal, N. Y.



Hinge Pin Flares Tubing



A BALL-END hinge pin borrowed from a house door serves nicely when you have to flare the ends of a few pieces of copper tubing. Clamp the tubing in vise-grip pliers, place the pliers over the open jaws of a bench vise and tap the ball end of the hinge pin into the end of the piece of tubing. —Albert P. Zanelli, Tampa, Fla.



in

for ice

and sleet. Ice and sleet are just as likely to cause accidents in the South, where their occurrence is rare and people are not accustomed to them, as in the North.

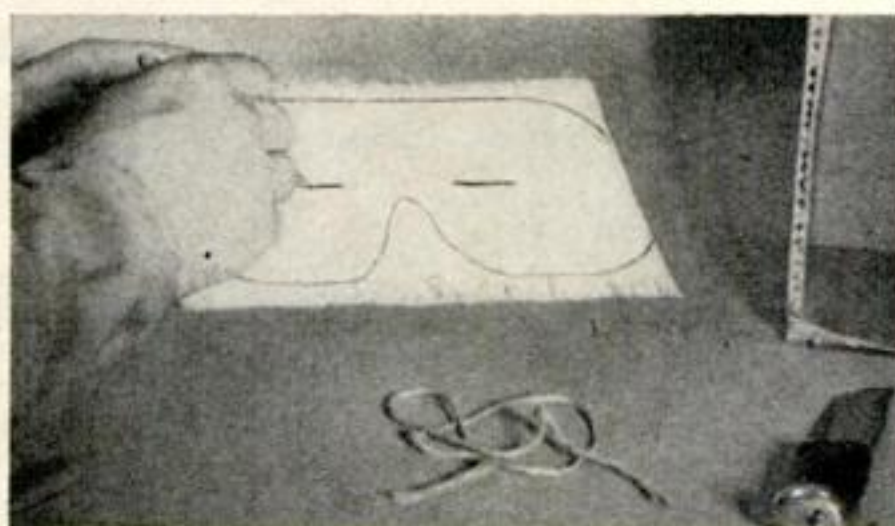
NORTH OR SOUTH, the person who survives is the one who notices and is prepared to meet winter conditions. Try to clean the snow off walks and steps before the snow freezes to the surface or turns to ice. Put sand, ashes or salt on ice. Be sure to watch your step. If icicles form on your roof overhang, knock them off before they get big enough to fall and hurt passersby. When driving, keep your windshield clear, use chains or snow tires, and stay well behind the car ahead. Always remember to turn into a skid. Brake by pumping the pedal. But most important of all in driving: go slow.



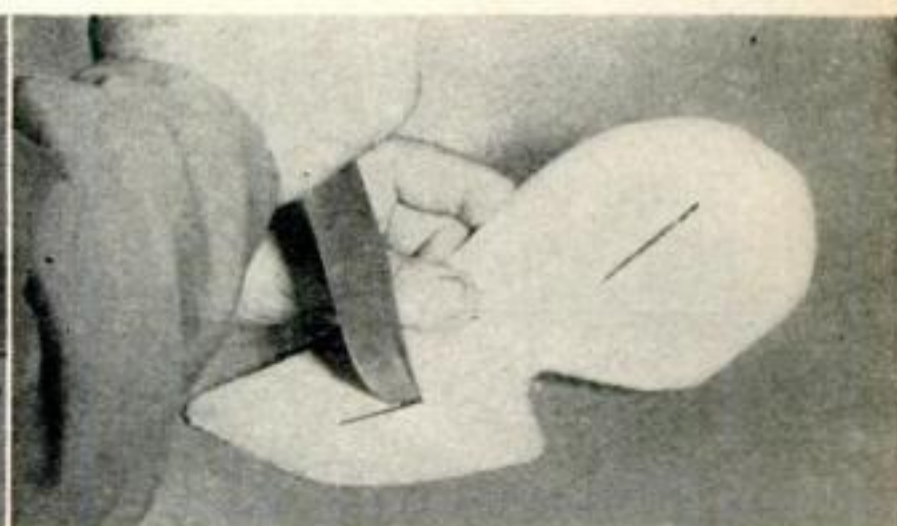
How to Make a Snow Mask

Using a trick borrowed from the Eskimos, you can quickly cut a cardboard eye shield.

IF YOU engage in winter sports that leave you exposed to sunlight on snow or ice for long periods—beware of sun glare. Your eyes may be damaged if they are not protected. This emergency eye mask, an idea borrowed from the Eskimos, can be quickly made from a piece of cardboard. Narrow slits block out dangerous light rays coming from below.



1 CUT A 10"-BY-4" PIECE of fairly pliable cardboard. Draw mask outline, making nose channel a bit shallow so that it can be trimmed to bring eye slits into position.



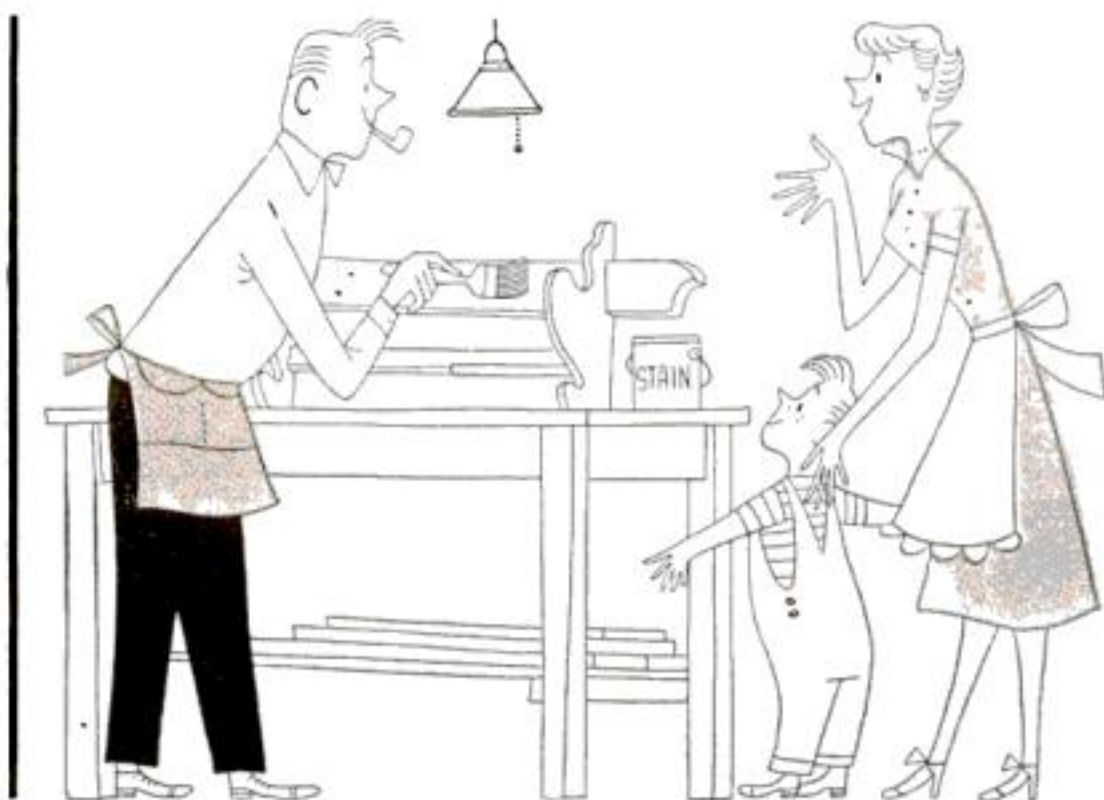
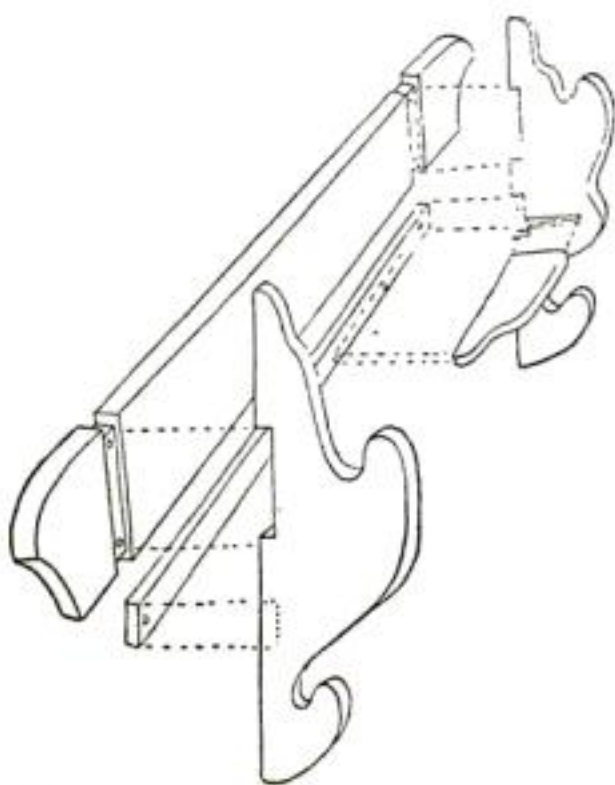
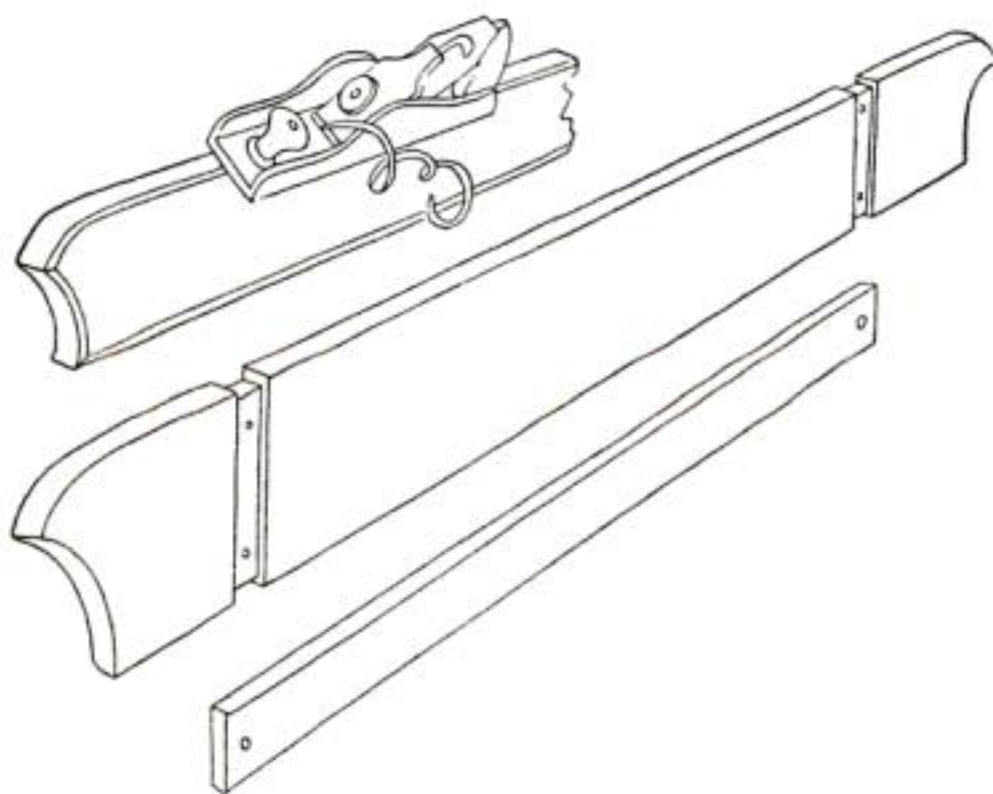
2 A HUNTING KNIFE is excellent for cutting out the mask. Try to work on something flat, especially for the slits. Make these about 1/16" wide and as long as your eye.

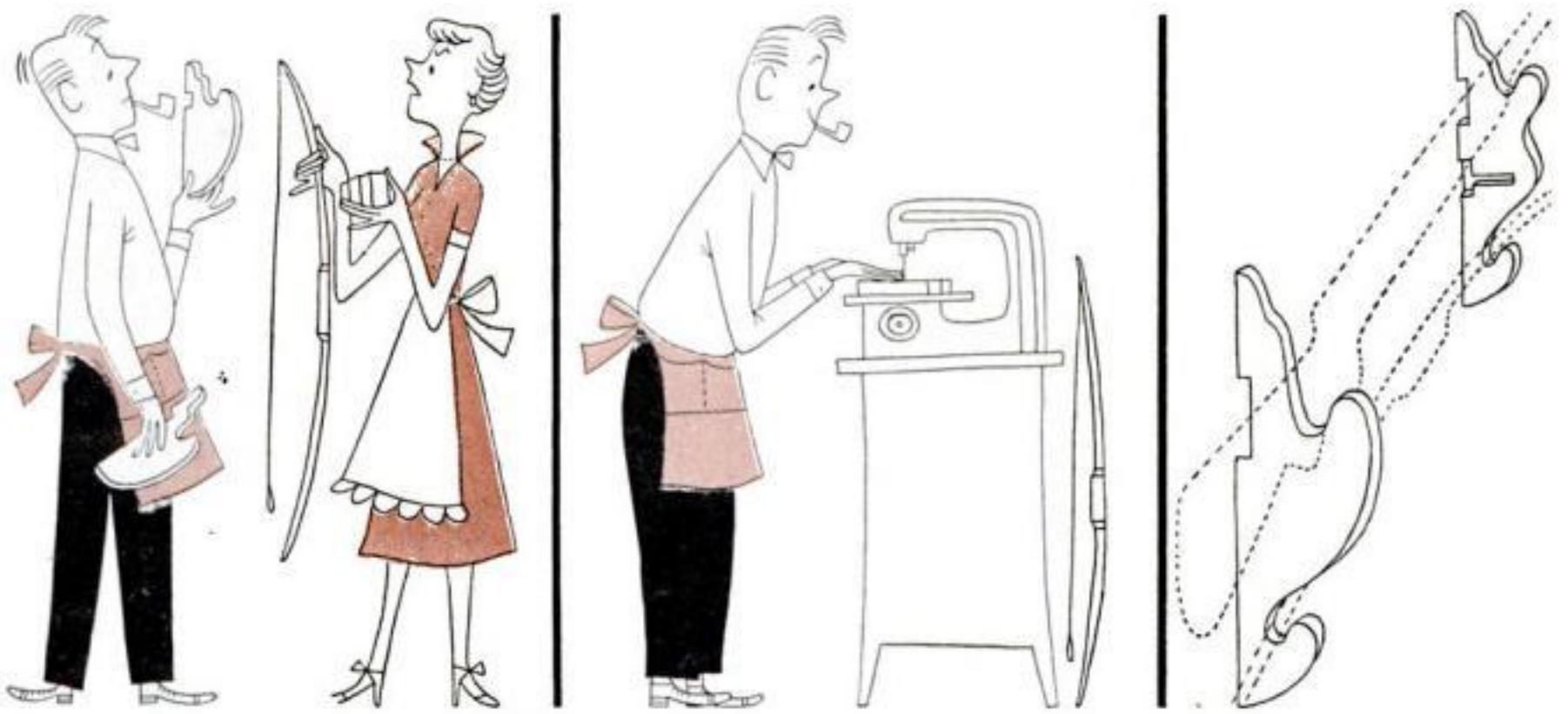
3 PUNCH HOLES at each end of the mask. Through one hole tie a piece of string long enough to go around your head so that it can be fastened at other end for a snug fit.

4 DARKEN THE INSIDE around the slits. A pencil, piece of charcoal or burned stick will do the job. This prevents light from bouncing from cardboard back into eyes.



Wordless Workshop



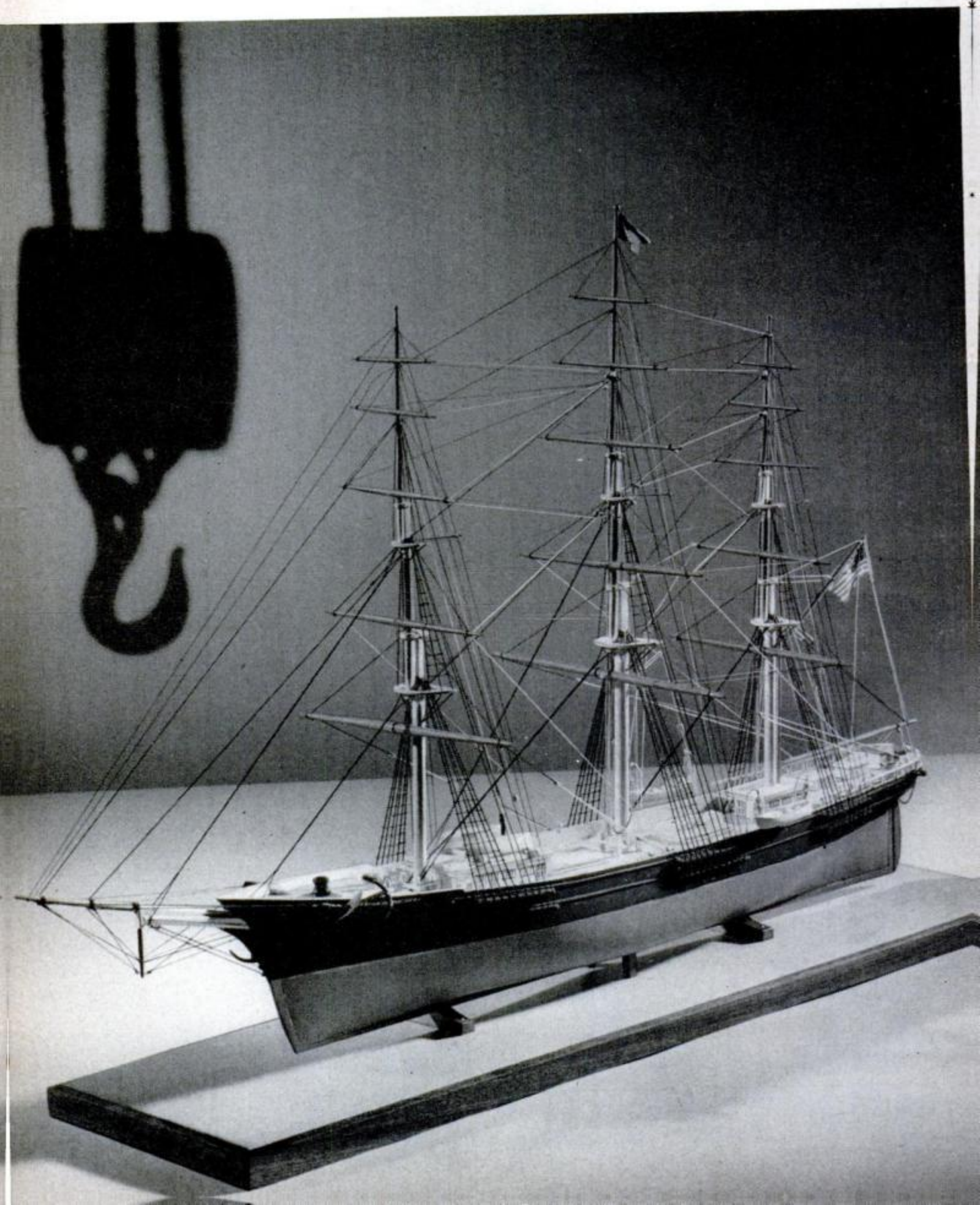


See PSM next month for another Wordless Workshop.

DECEMBER 1953 201

By Winthrop Pratt Jr.

How to Build the



World's Fastest Clipper Ship

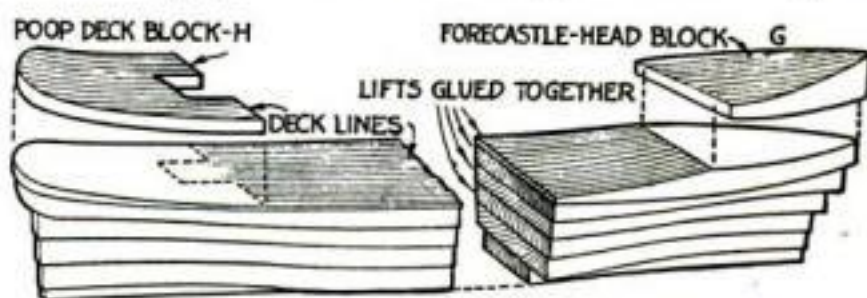
Famous plans by a master modelmaker show you the easy, step-by-step construction of this fascinating model.

A HUNDRED years ago, the world's fastest clipper ship, *Sovereign of the Seas*, dashed out of Honolulu, bound homeward to New York on a breath-taking journey that was to set a new speed record for sailing ships. On one stretch of that voyage, she raced 3,562 miles in just 11 days. No sailing ship has since equaled that record, and none now ever will.

You can build a scale model of this ship that will be a family treasure for the next 100 years. The project calls for a scale of 1/12" to the foot, converting the *Sovereign's* 318' from bowsprit to stern rail into a gleaming 26½" miniature. The plans shown here are one-third actual size. All dimensions can be obtained by simply measuring the plans and multiplying by three. For the templates and hull contours, you can either have the plans enlarged photographically or scale them up yourself on squared paper. In either case, the full-size plans are then traced directly onto the wood, using type-writing carbon paper, to give you the outlines for sawing.

Building up the hull. To speed construction, the hull is left solid. It consists

of six layers or "lifts" of pine, each 3½" wide, 20" long and 5/12" thick, built up like a sandwich as shown below. Since the 5/12" dimension is the usual thickness of ordinary planed ½" stock, you have only to



buy the pieces, trace on the proper contour for each lift, and jigsaw the parts to shape. Then, starting with lift F, turned upside down, glue on each succeeding lift, aligning them carefully and inserting small brads to keep the layers from shifting when you apply the clamps.

When the glue is dry, it's time to cut the deck curve, called the sheer, that runs from forecandle to stern. Use a flat chisel or spoke-shave, at the same time shaping in a slight camber or downward curve from the center line to the sides. Sand the deck smooth and pencil in the planking lines—10 to the inch.

The forecandle and poop blocks are glued

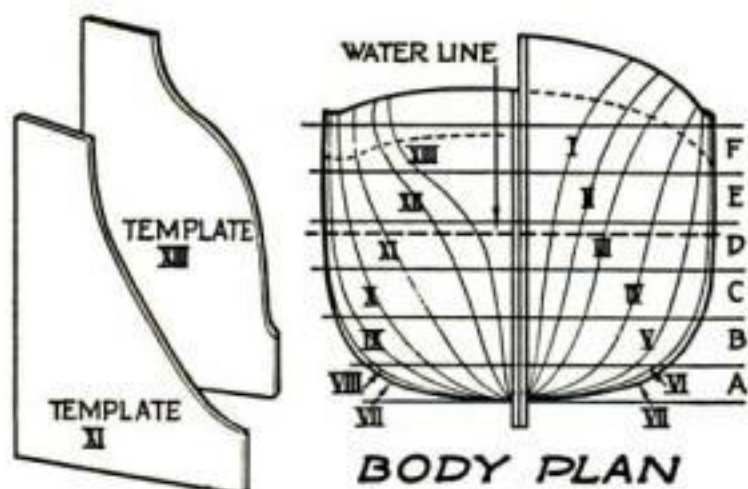
MEN who have been reading POPULAR SCIENCE MONTHLY for 30 years or more fondly recall the late Capt. E. Armitage McCann's articles on model-ship building. One of today's outstanding builders of model ships is Winthrop Pratt Jr. of Dorchester, Mass. This past summer, Mr. Pratt built a model of one of the world's most famous ships. To do so, he used the plans published in POPULAR SCIENCE MONTHLY in 1926 by Captain McCann. The issues in which Captain McCann's articles first appeared are now out of print. But many enthusiasts still consult them in libraries which have bound volumes of this magazine. For the benefit of others who do not have access to the original work, the editors asked Mr. Pratt to prepare this article. The plans shown are those of Captain McCann; the photographs are the work of Mr. Pratt.



on next. The forecastle block is $\frac{3}{4}$ " thick at the bow, $\frac{1}{4}$ " thick at its aft end. The poop block is cut out to receive the cabin house and overhangs at the stern.

Shaping the contours. You're now ready to cut the crusts off your sandwich, shaping it down to the sleek hull lines that sent the *Sovereign* smashing one speed record after another.

From the body plan below, shown one-third actual size, scale up a full-size drawing



and cut out 13 templates, transferring their outlines to stiff cardboard with carbon paper. These templates show the hull contour at each corresponding station marked on the full-length sheer plan.

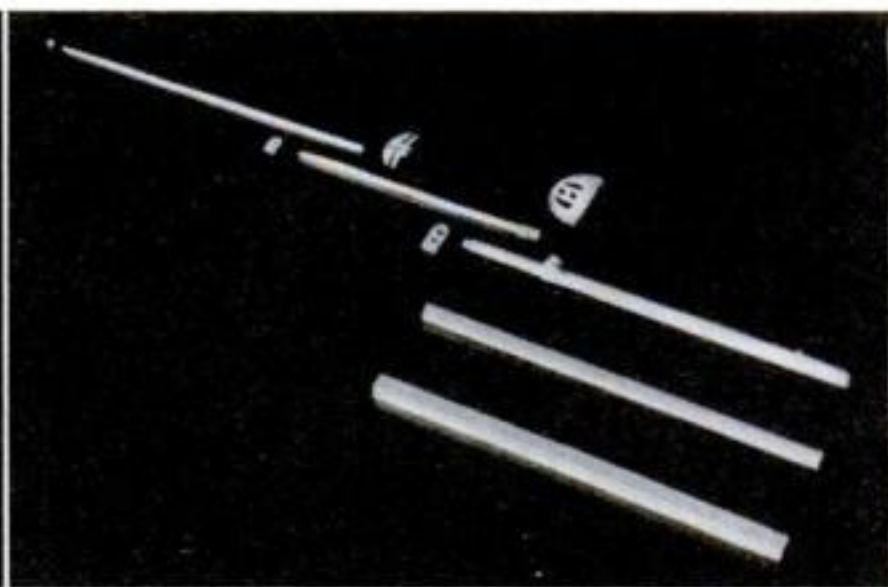
Pad the jaws of your vise to protect the wood and clamp in the hull on its side. With a curved chisel, spokeshave or half-round rasp, gradually shave away the excess wood, trying the templates frequently, until the curve of the hull exactly matches the template at each station. Start at the midship line and work toward each end, then turn the hull over and shape the other side in the same way. Trim the bow and stern to fit the $\frac{1}{8}$ "-thick stempost and sternpost and sand the entire hull smooth.

Adding hull detail. The bulwarks are $\frac{3}{32}$ " pine, $\frac{1}{4}$ " wide and 13" long. Cut rabbets $\frac{3}{32}$ " deep and $\frac{3}{16}$ " down from the deck line, as shown in the sketch, and glue and nail the pieces in place.

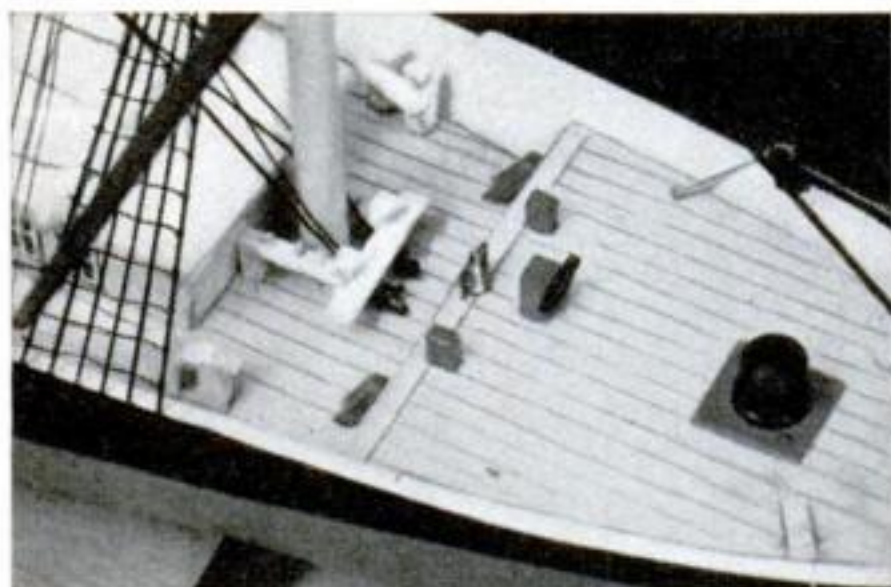
[Continued on page 232]



MAKING A YARD. Stock is first split out to insure straight grain, squared up and tapered at ends. Then piece is planed to eight-sided shape and finally sanded round and smooth.



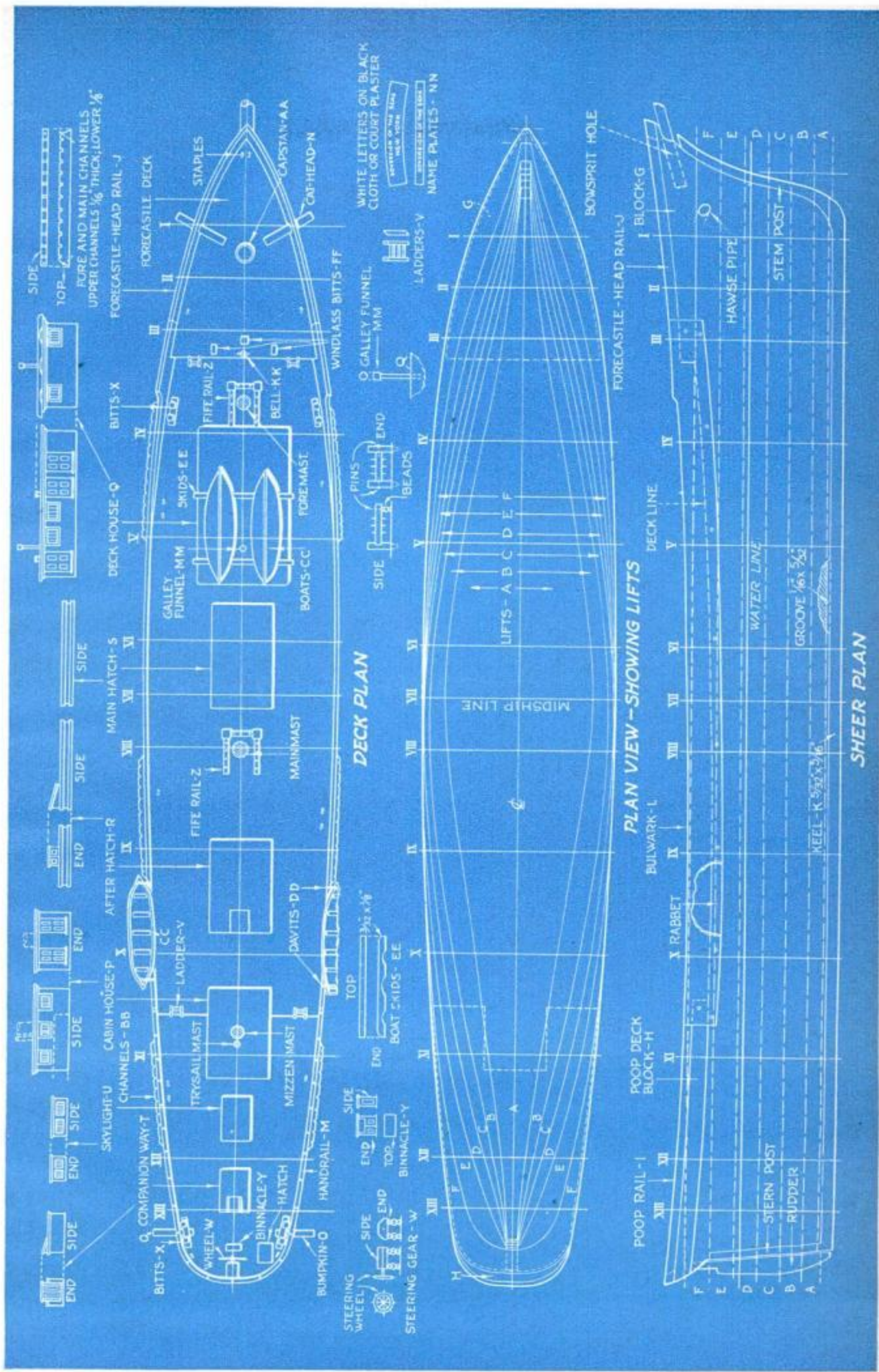
MASTS ARE MADE in same way as yards, but with single taper toward top. Tops, caps and crosspieces are cut from thin wood, fiber or plastic and glued on to join mast sections.

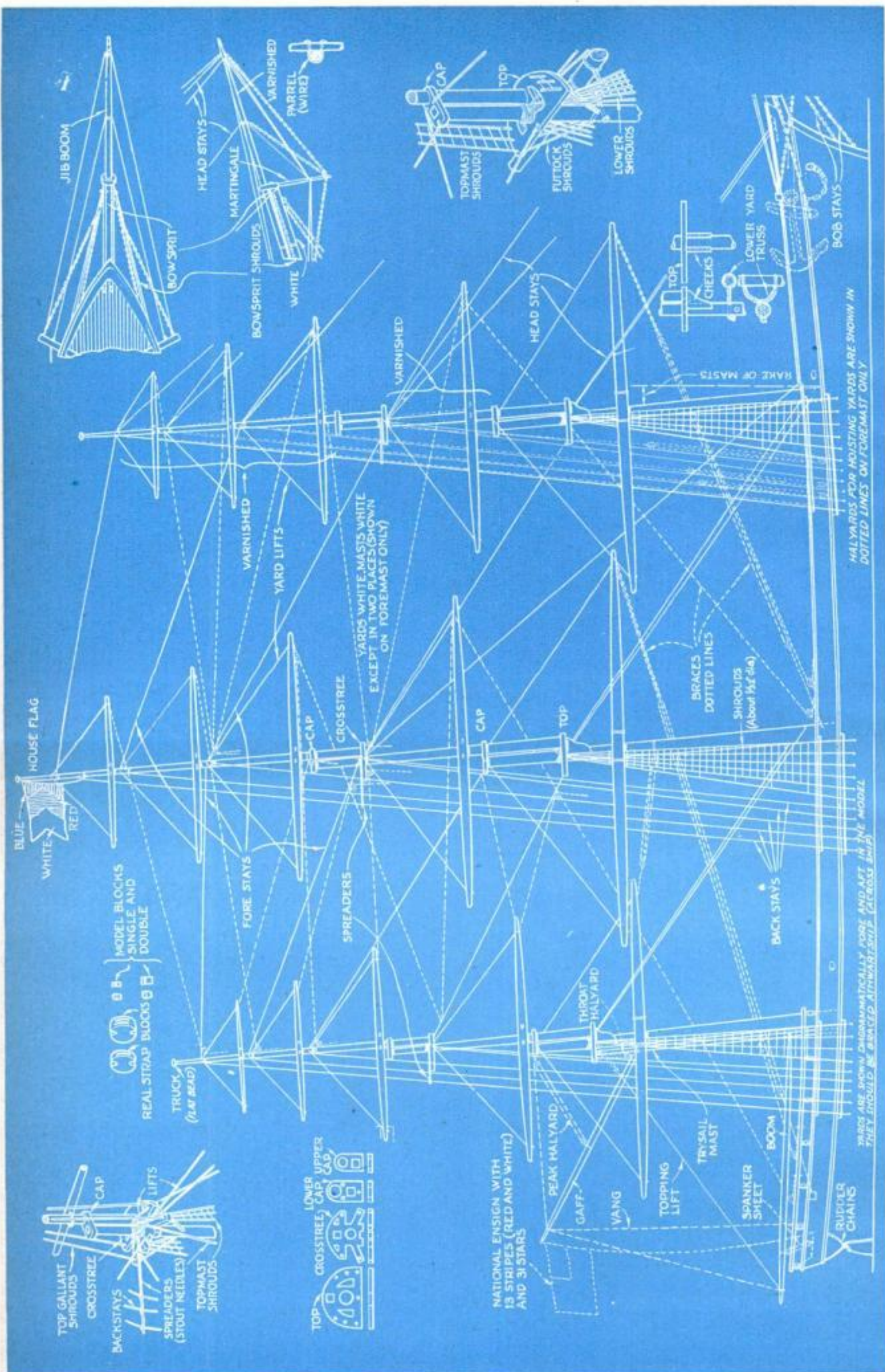


FORECASTLE VIEW shows lower foremast, fife rail, bitts and ship's bell. Pencil lines on deck simulate wood planking. Bell, blocks, other fittings can be bought at hobby shops.



CLOSE-UP OF MIZZENMAST shows top and cap that join topmast to lower mast. Lower shrouds pass through slots in top; topmast shrouds are threaded through holes in top.







MODEL MAKERS can render small wooden sections so flexible they can be knotted (left above). Plastic, when steamed, can be bent.

Extra Uses for a Bottle Warmer

These electric gadgets boil water and generate steam so quickly that you can use them for many jobs.

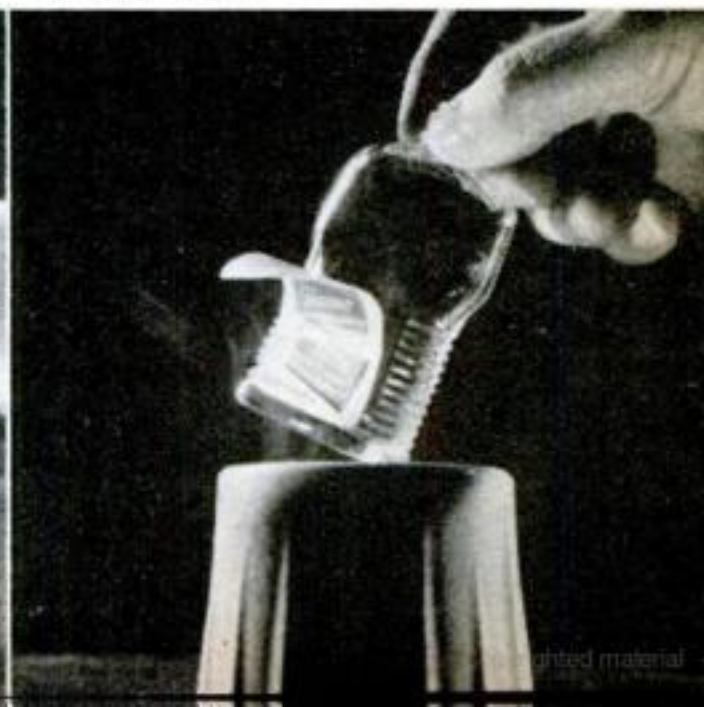
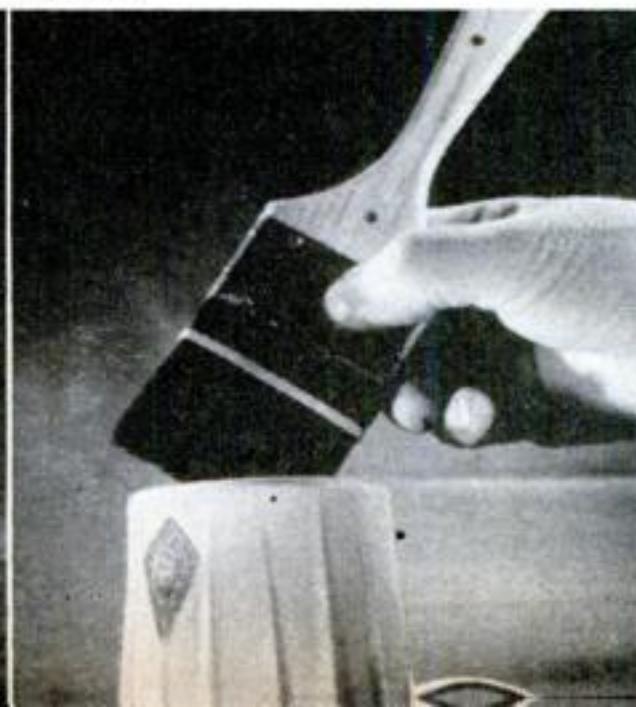


COOKS can use a bottle warmer to boil eggs or to prepare individual servings of baked potatoes or other vegetables.

DISTILLED WATER is made when steam condenses on glass of cold water and drips into lower glass. Partly cover warmer with cardboard.

PAINTBRUSH can be reshaped if you let steam soften bristles. While steaming, hold bristles loosely together with rubber band.

LABELS on bottles that you want to re-use can be removed in seconds. You can also remove stamps from envelopes in this way.





Brad Locks Caster

A TYPEWRITER table that rolls around on its casters while you're pounding away can be mighty annoying. Here is an easy way to lock the casters. Take off the two front casters and drill small holes through the rollers and bodies, as shown above. A brad slipped through the two holes will keep the roller from turning.

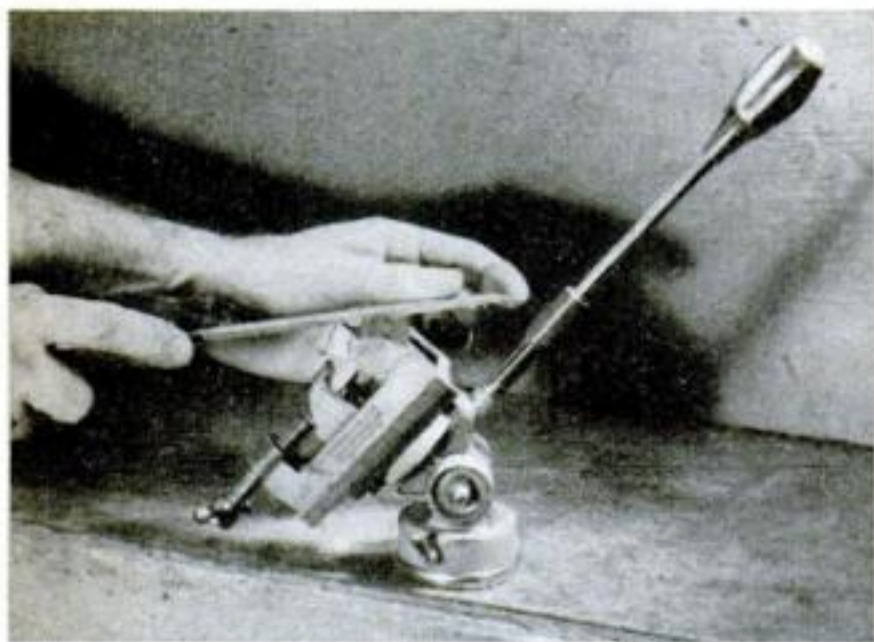


Nail Can Carried to the Job

WITH containers like those pictured above, you will never have to sort nails to find the right ones for the job at hand. Glenn Mann, Carthage, Ind., made one of the buckets for every size nail he keeps in his shop. They are gallon cans cut down and fitted with dowel handles. The buckets are carried to the job.—George Laycock, Batavia, Ohio.

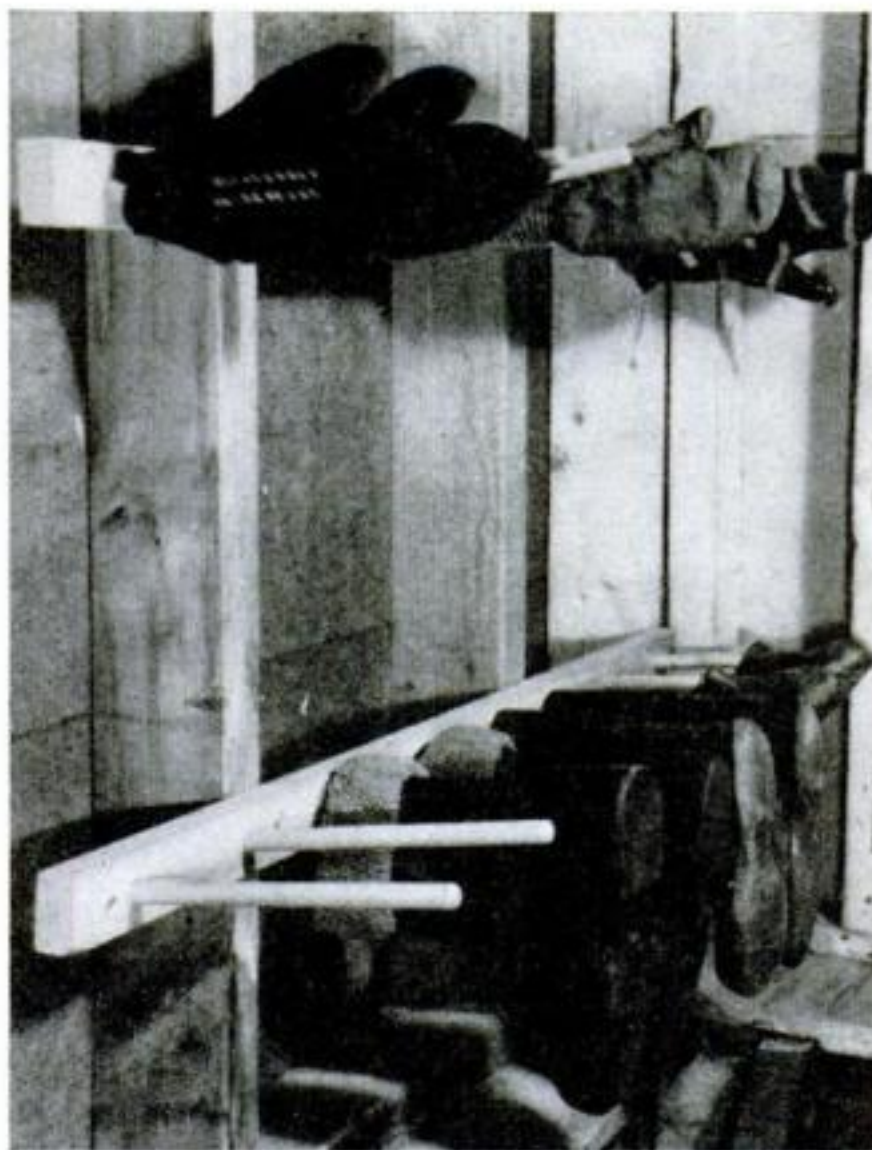
Resurfacing Workbench

A WORKBENCH top that has become scarred and unsightly can be renewed simply by nailing on a panel of tempered hardboard. This material will withstand long, rough use.



Vise Plays All the Angles

MARRY a small vise to a camera-tripod head and you can swing your work to any direction. The vise is mounted by first attaching it to a bottom block of $\frac{1}{4}$ " hardboard or aluminum in which a hole has been drilled and tapped for a $\frac{1}{4}$ "-20 tripod-head screw. The head is fastened to the bench by a $\frac{1}{4}$ "-20 bolt.—Walter E. Burton, Akron.



Rack Helps Keep House Neat

THE novelty of a boot-and-mitten rack all their own may induce the youngsters to hang up wet gear. This one is one-by-twos with 7" lengths of $\frac{1}{2}$ " dowel driven into angled holes 5" apart.—K. Greif, Vestal, N.Y.

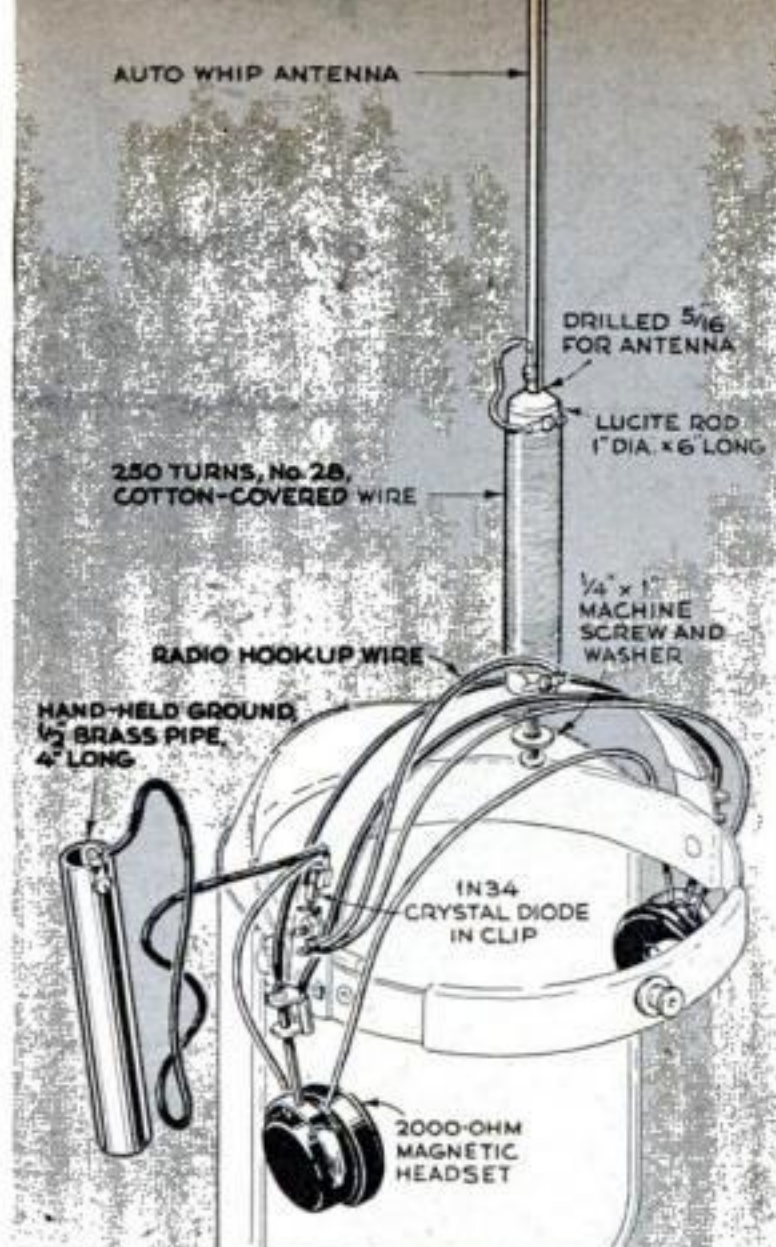
*A Project
for Christmas*

Radio Helmet for Space Fans

Mounted on a plastic eye shield, this real radio takes your kid out of this world—and it will make him captain of the crew.

“OVER 'n' out... over 'n' out” will really mean something to the boy who wears this radio helmet. The voice from the magnetic earphones may just be telling him the time, what to use on his hair or how to bake a cake. But to an imaginative modern lad it will be the control tower at the space academy giving vital instructions for coming in from outer space. Like the crystal sets of the early twentieth century, the outfit is self-contained and needs no batteries.

The miniature receiving station is built on a plastic eye shield—the type used by grinders or servicemen handling TV tubes. Heart of the set is a tiny germanium diode, type IN34, connected between a coil and a brass handgrip, which serves as a ground by utilizing the body capacity of the wearer. A telescoping auto antenna brings in the signal, preferably from the strongest radio station in the locality. The coil shown is wound for 660 kc. (660 on a radio dial). Removing turns will bring the local station in stronger if it is transmitting above 660 kc.—*Elbert Robberson, Port Washington, N.Y.*





Easy-to-use materials for printing pictures—ideally suited for beginners. **Kodacraft Printing Kit**, \$4.95.



Essentials for developing and printing pictures, including roll-film tank. **Kodacraft Photo-Lab Outfit**, \$9.75.



Complete developing, printing equipment incl. metal printer. **Kodacraft Advanced Photo-Lab**, \$14.95.



For efficient print drying. Stops tendency of prints to curl. Use it over and over. **Kodak Blotter Roll**, \$2.88.



Easy to use. Simple to load in dark. Takes 620-120 and 127 roll films. **Kodacraft Roll-Film Tank**, \$2.53.



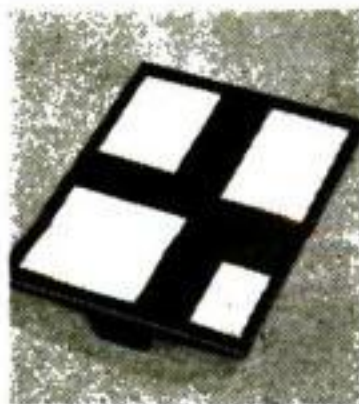
For simultaneous development of two rolls of 828 or 135 film. **Kodacraft Miniature Roll-Film Tank**, \$2.53.

Save time—Shop here for the photo fans on your Christmas list

These two pages give you some idea of the many useful and inexpensive gift ideas at your Kodak dealer's. Visit him soon. He'll be glad to help you choose just the right gift for every photo fan on your shopping list.



For accurate darkroom temperature control. You have choice of four **Kodak Thermometers**, from \$.55.



New-type printing frame of steel construction. Includes a set of masks. **Kodacraft Printing Frame**, \$1.65.



Converts tray to efficient, trouble-free washer for prints or films. **Kodak Automatic Tray Siphon**, \$4.50.



Tilting base, minute and split-second hands, large dial. Intervals up to 60 minutes. **Kodak Chemical Scales**, \$14.50.



Chemical-resistant plastic housing protects all working parts. **Kodak Chemical Scales**, \$14.50.



Includes three cups for darkroom work with both papers and films. **Brownie Darkroom Lamp Kit**, \$1.75.



New darkroom safe-light provides direct or indirect illumination—or both. **Kodak 2-Way Safelamp**, \$4.50.



Can be used either from a drop cord or in a wall plug. Includes safelight filter. **Kodak Darkroom Lamp**, \$5.75.



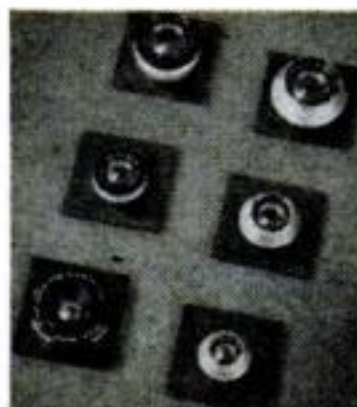
For wall, shelf, bench. Includes switch, cord, safelight filter. **Kodak Adjustable Safelight Lamp**, \$8.75.



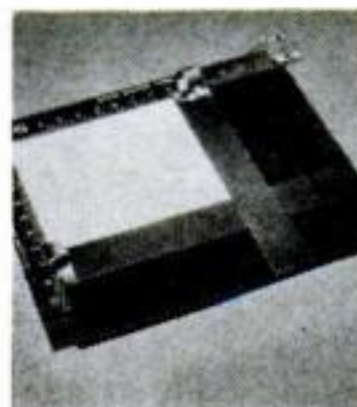
For determining correct printing time—saves both paper and time. **Kodak Projection Print Scale**, \$1.15.



Cool, circline fluorescent lamp, integrating-sphere lamphouse are prominent features in each enlarger. **Kodak Hobbyist Enlarger** (left), \$57.50, complete with f/6.3 lens. **Kodak Fluorolite Enlarger** (right), \$99.50 (lens extra).



Lenses for the Fluorolite Enlarger range from 50mm. f/4.5 "Ektanon" to 4-inch f/4.5 "Ektar." From \$15.00.



For accurate masking of enlargements with any vertical enlarger. **Kodak Masking Easel**, 11 x 14. \$15.00.



View-type camera—permits one-to-one close-ups. **Kodak Fluorolite Camera Combination**, \$69.50 (less lens).



Expertly made Kodak Field Cases make cameras easy to carry, offer sound protection together with smart appearance. Include fine-quality leather cases (left), and durable simulated leather (right). **Kodak Field Cases**, from \$2.65.



Automatically trips shutter, permits photographer to get into picture. **Kodak Auto-Release**, \$3.86.



Provides dependable "flash" for most internally synchronized cameras. **Kodak Standard Flashholder**, \$8.25.



B-C (battery-condenser) flash insures longer battery life, sure synch. **Kodak B-C Flashholder**, \$10.40.



For quick, easy multiple lighting, with Luma-clad reflector. **Kodak Flashholder Extension Unit, Model I**, \$11.00.



Condenser-type power for dependable "flash." **Kodak B-C Flashpack**, \$2.95 (without 22½-volt battery).



Sensational new battery-condenser flash system. **Kodak Ektalux Flashholder (Standard Bracket)**, \$29.75.



Holds your camera and flash extension unit on most flat or tubular surfaces. **Kodak Flexi-clamp**, \$4.95.



For use with new Brownie Hawkeye Camera, Flash Model. Very easy to attach. **Kodak-lite Flashholder**, \$4.00.



Permits close-range picture taking with most fixed-focus cameras. **Kodak Close-up Attachment**, \$1.63.



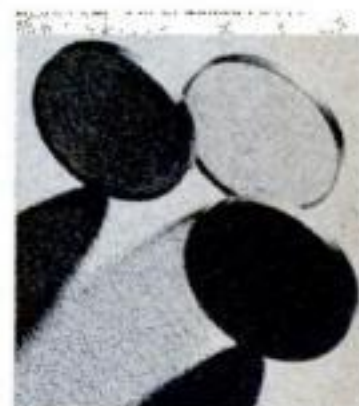
Now, a filter designed for inexpensive box cameras — emphasizes clouds. **Kodak Cloud Filter**, \$1.85.



It's easy to get extreme close-ups with both still and movie cameras with **Kodak Portra Lenses**, from \$2.65.



Shades camera lens and reduces sky flare — attaches to adapter ring. **Kodak Lens Hood**, from \$1.75.



Popular yellow (K2), red (A), and green (X1) filters to fit most cameras. **Kodak Wratten Filters**. From \$1.75.



Two compartments hold 4 filters, adapter ring, lenshood. **Kodak Combination Filter Cases**, \$4.25, \$4.95.



New-type slide-feeding mechanism, cool operation, elevating device. **Kodaslide Merit Projector**, \$26.10.



Two superb new slide projectors. **Kodaslide Highlux III Projector** (left), 300-watt; quiet fan; blower, carry case, \$56.50. **Highlux II** (right) gives brilliant 200-watt projection. Converts to Highlux III. \$36.50. Carry case, \$7.50.



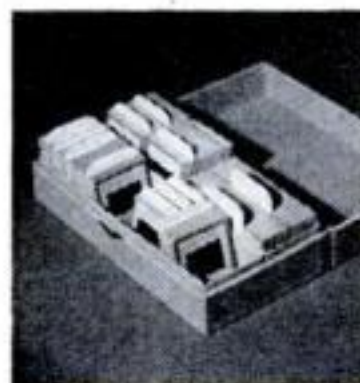
2x2 projector and screen in a single unit. Usable in fully lighted room. **Kodaslide Table Viewer 4X**, \$37.50.



Projector, screen, changer in one unit. **Kodaslide Table Viewer, Model A**, \$97.50.



Compartments for 240 cardboard or 96 glass slides. **Kodaslide Compartment File**, \$3.94.



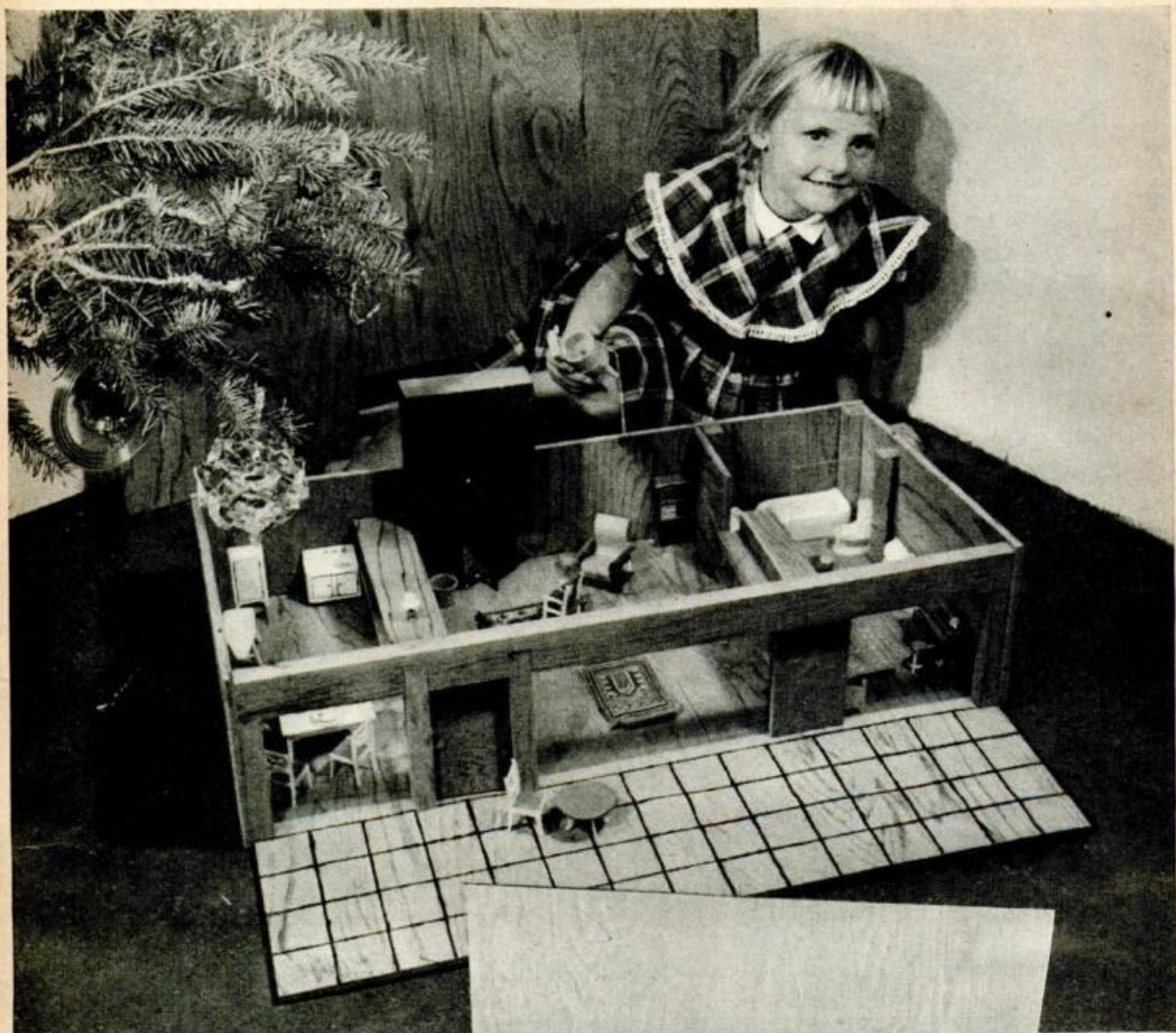
Holds 360 2x2-inch or 160 stereo slides. **Kodaslide Flexo File**, \$1.25.



Materials for mounting 50 color transparencies in glass. **Kodak Slide Kit**, \$3.63.

Prices include Federal Tax where applicable and are subject to change without notice.

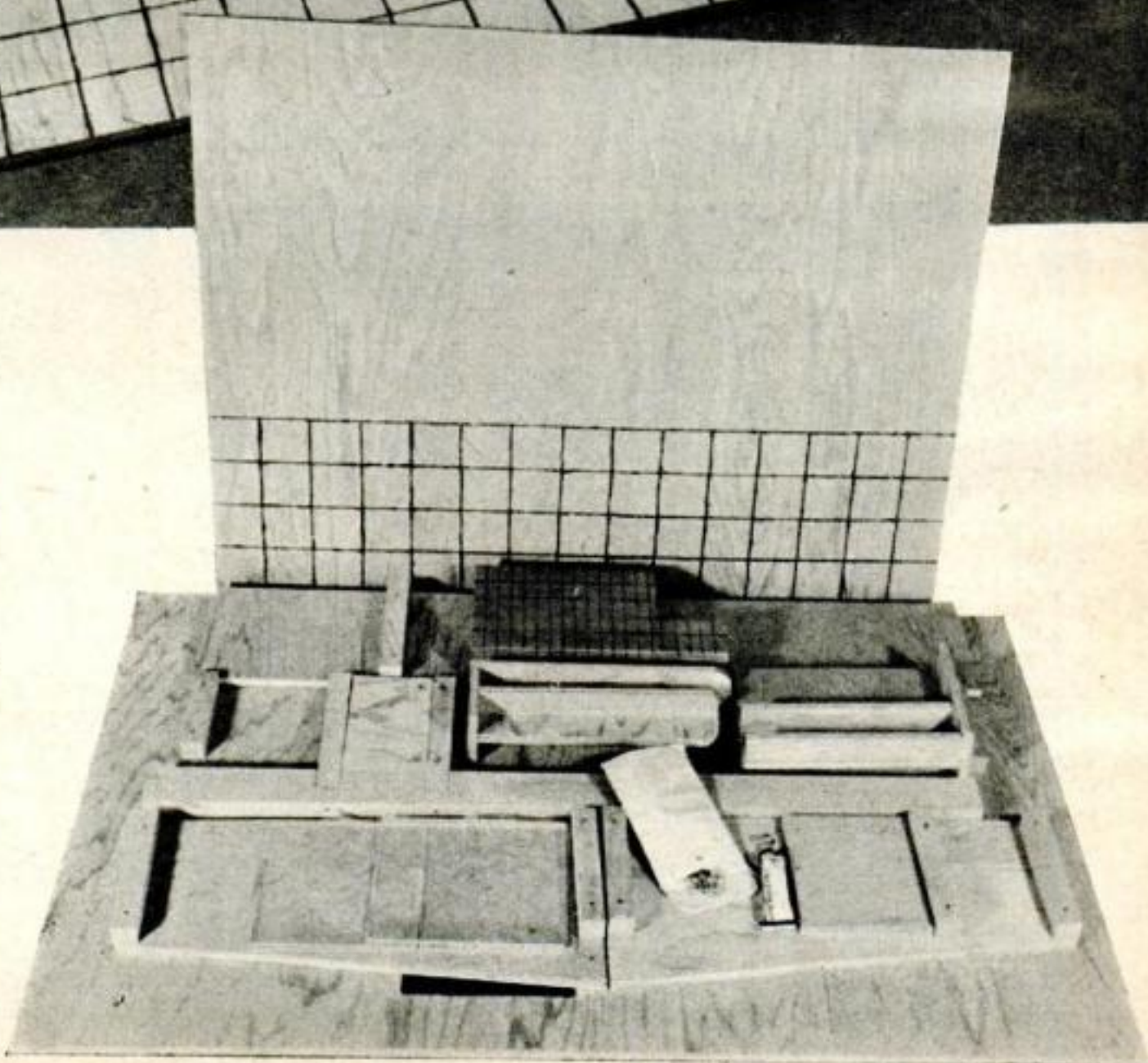
Kodak



*A Project
for Christmas*



DOLLHOUSE PACKAGE at right is prefabricated in parts to be stored or mailed, quickly assembled Christmas morning, as shown above, with screws and brads. Parts can be fastened with glue later.



Prefab a Modern Dollhouse

Picture windows not only give up-to-the-minute styling but let the young owner see inside without taking off the roof.

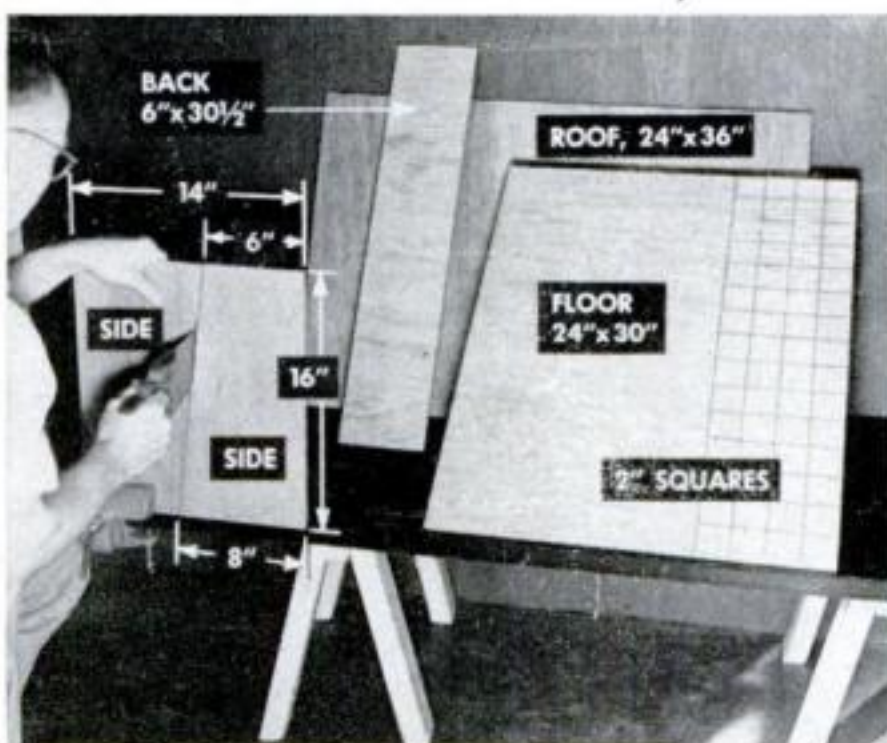
By Darrell Huff

THIS dollhouse will delight any little girl because it is so modern—with a big picture window for her to show off to all how handsome it is inside.

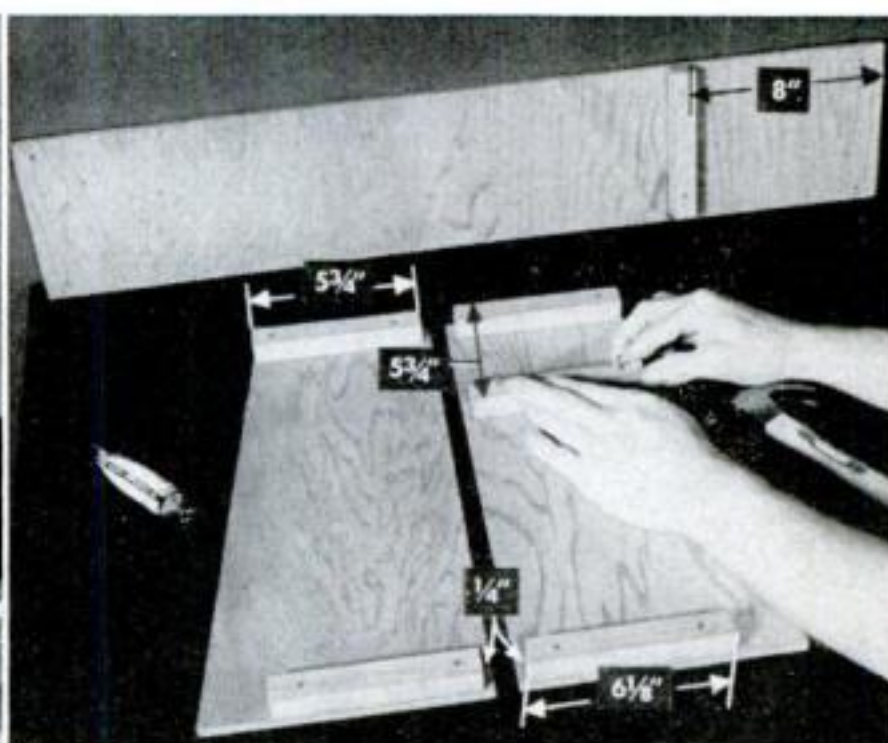
And its modern simplicity means that it is easy to build. All the tools needed are a

hammer, screwdriver, drill, coping saw and all-purpose saw.

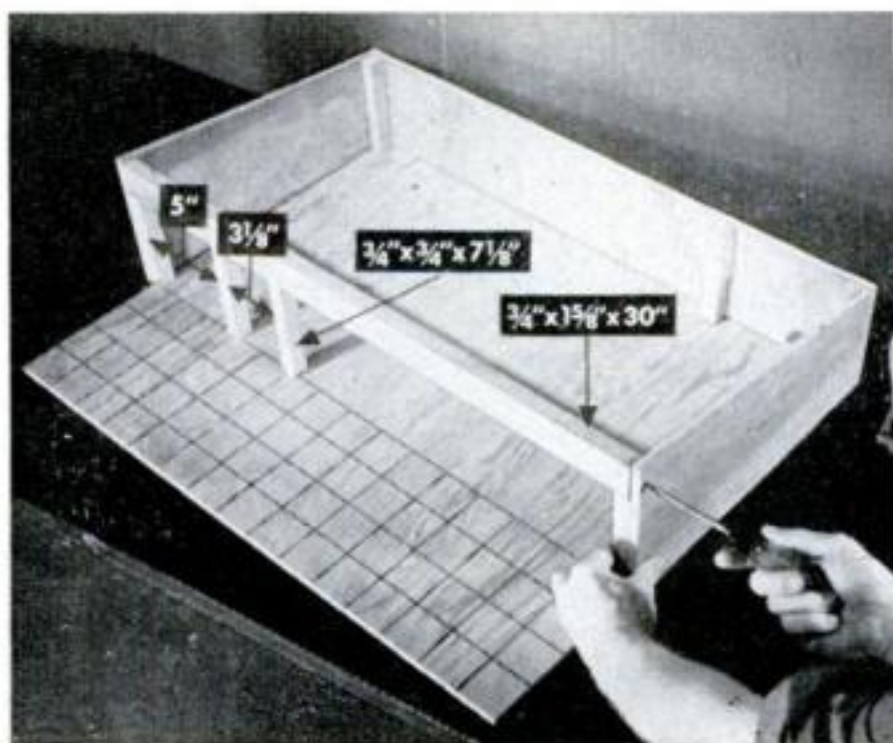
Materials needed include a 4'-by-4' sheet of $\frac{1}{4}$ " plywood, 5' of $\frac{3}{4}$ "-by- $\frac{3}{4}$ " wood, a 30" length of one-by-two ($\frac{3}{4}$ " by 1 $\frac{3}{8}$ "), a 2"-by-6"-by-9" wood block (for chimney), and clear sheet plastic to make the windows and bathroom partition.



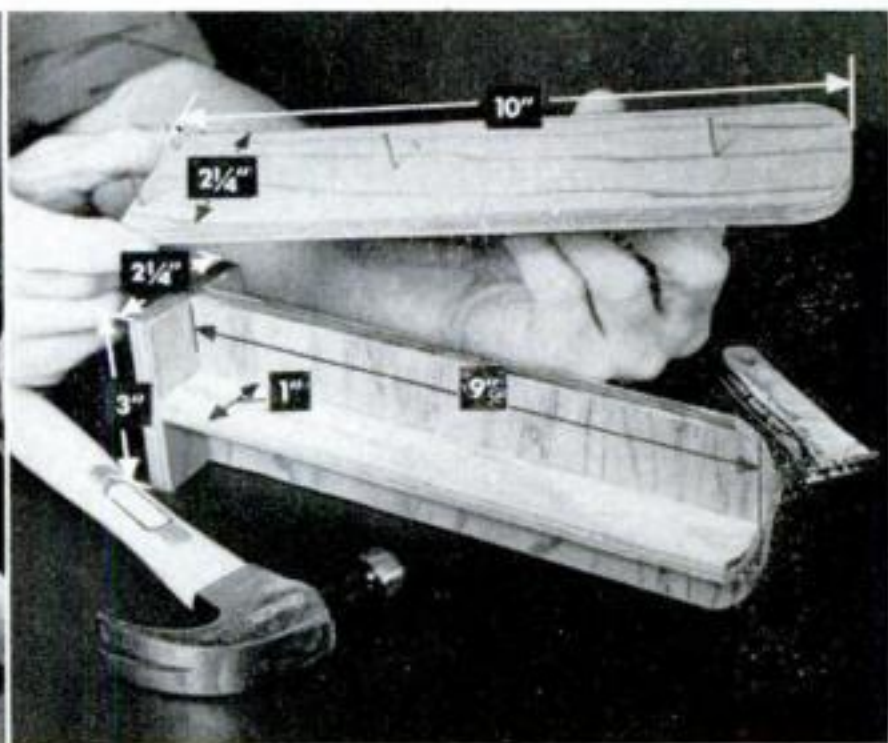
1. HERE ARE MAJOR PARTS. From plywood also cut 3"-by-6" door, 5 $\frac{3}{4}$ "-by-5 $\frac{3}{4}$ " bathroom wall, cabinet and storage wall. Squares give effect of tiled terrace.



2. CLEATS cut from $\frac{3}{4}$ "-by- $\frac{3}{4}$ " wood are located $\frac{1}{4}$ " from lower edge of sides and back so these three members can butt down over edge of floor. Glue and nail them.

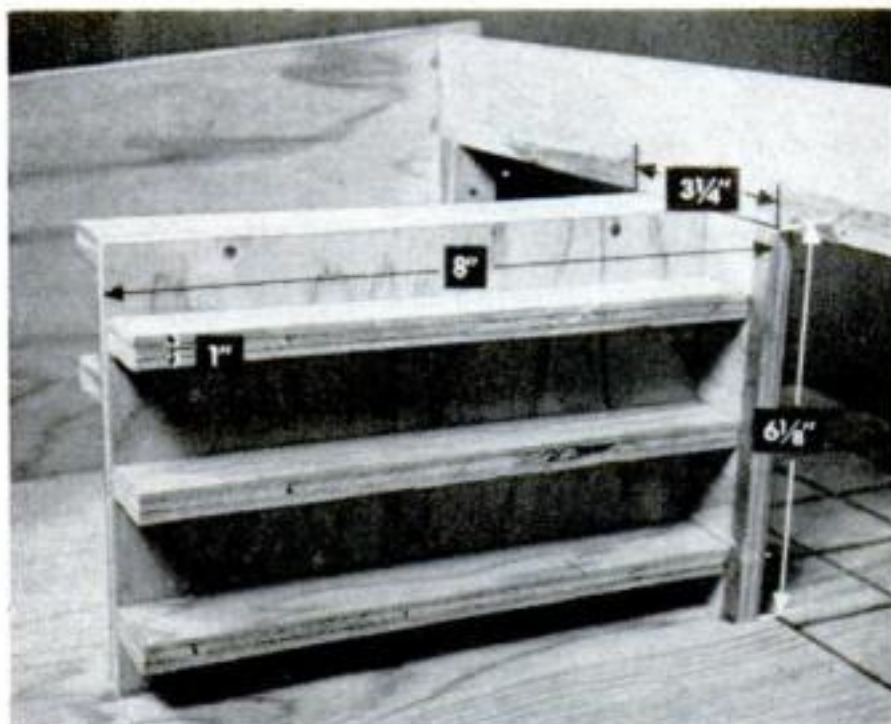


3. NOTCHES cut 1" deep in lower edge of the crossbeam for the door posts will give a stronger construction. Screw major assemblies together so they can be taken apart.

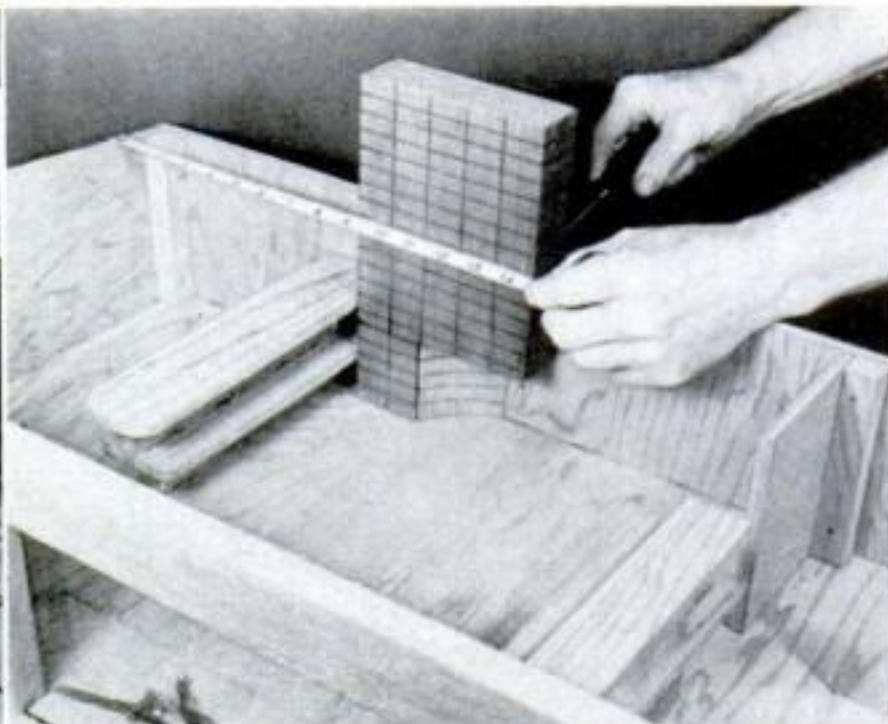


4. KITCHEN COUNTER is cut and assembled like this. There are two shelves back to back. Round corners of counter, partition and shelves. Assemble with glue and nails.

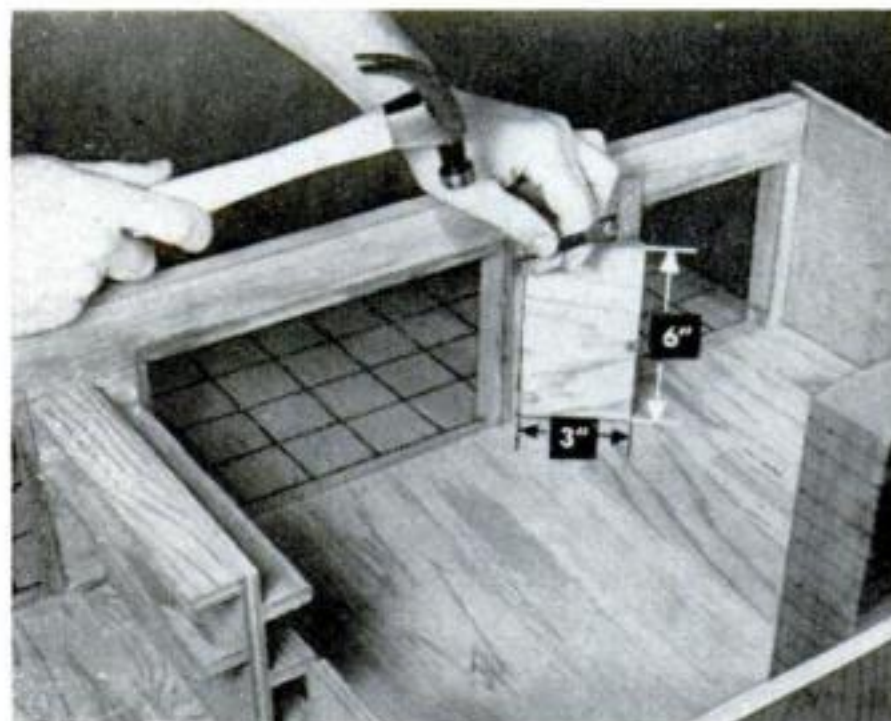
Please turn the page for more dollhouse photos. DECEMBER 1953 213



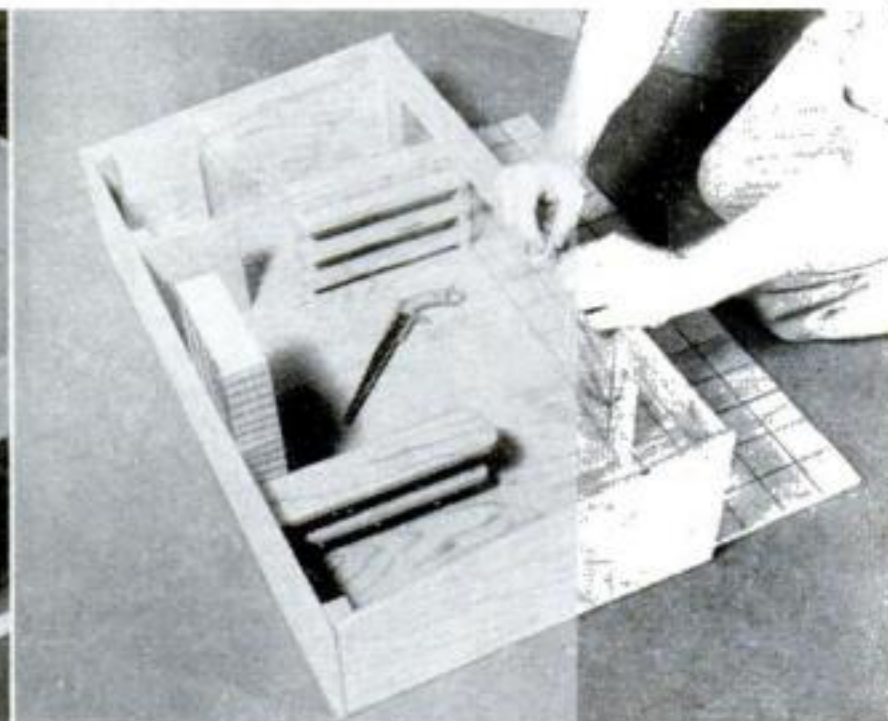
5. AFTER BUILDING STORAGE WALL locate it under front beam to form bedroom-living room partition. Locate it to leave space $5\frac{3}{4}$ " wide for the bedroom window.



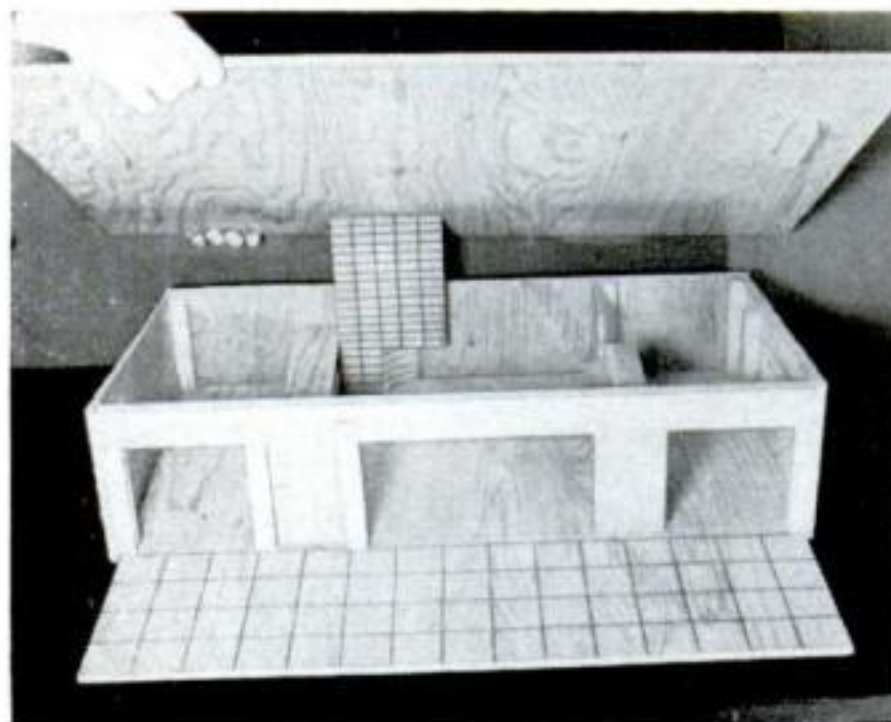
6. CURVED NOTCH in chimney block makes a fireplace. Rule or burn lines to simulate bricks. Locate its near edge 14" from corner. Nail bathroom wall in place.



7. TINY BOX HINGES hang the plywood door and the door knobs are thumbtacks. Dimensions given allow $1/16$ " clearance all around door. This can be reduced a bit if desired.



8. CUT PLASTIC to suit three window openings and a $5\frac{3}{4}$ "-by-6" piece for bath partition. Tape in place for temporary use. Sanding will make bath partition opaque.



9. ROOF PANEL has hole for chimney, located so as to give symmetrical overhang of roof. Short cleats under roof hold it in place. Finish can be Firzite plus lacquer or paint.



10. THE YOUNG LADY will want to choose her own furnishings from the ingenious plastic miniature pieces that are available in many stores at Christmas time.

Tom McCahill says—

TOM McCahill, well known, free-lance automotive journalist whose test reports of American and European cars appear regularly in *Mechanix Illustrated* magazine.

"The finest automobile engine in the world
is no better
than its weakest
spark plug!"



"I've been around automobiles for a long time and have road-tested practically every make of hack put together on these shores or across the pond. You learn a lot about any engine when you start dishing out the punishment. But there's one thing you discover quickly—the finest engine in the world is no better than its weakest spark plug.

"Spark plugs may look small and unimportant but, brother, if you want that mill of yours to unleash all its horses make sure you have the best spark plugs money can buy. That's where Champions take the spotlight. I've had stock Champions go on delivering the mail in car tests that were downright brutal.

Furthermore, I've watched Champion-equipped cars cream everything in sight in the world's great speed, endurance and reliability runs—from Indianapolis "500" to the LeMans 24-Hours.

"So take a tip from your Uncle Tom, and get set for winter driving by putting dependable Champion Spark Plugs in your car. They're your best assurance of positive starting and worry-free motoring when, 'the north wind doth blow and we shall have snow'."



AMERICA'S FAVORITE

CHAMPION

SPARK PLUGS

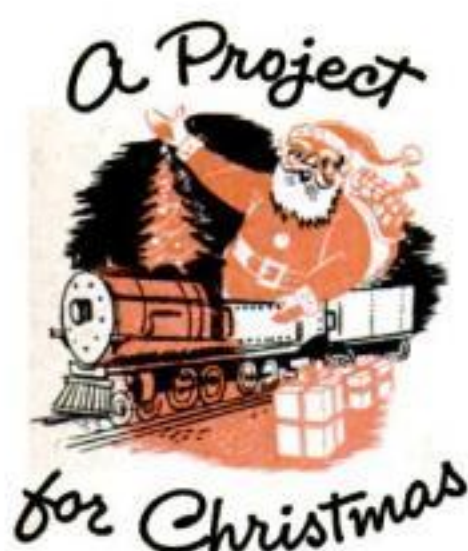


Stop in at the service station or garage displaying this poster!



CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

DECEMBER 1953 215



CONTROL PANEL is lodged in neat case fitted with carrying handle. Train transformer is set into center, fastened to it with small machine screws through the corners of the face plate.

Control Panel Eases Christmas Light Problems

You're a boss electrician with five individually controlled outlets, plus a special rig for the train transformer.

AT CHRISTMAS time you dream of a whole wall covered with electrical outlets—there never seem to be enough. This control board centralizes your Christmas-display lighting, and toggle switches permit individual control of everything, including the electric trains. During the rest of the year it will provide your shop more bench outlets than you'll ever need. If you can leave the train transformer on the board it will also give a wide range of low voltages for testing.

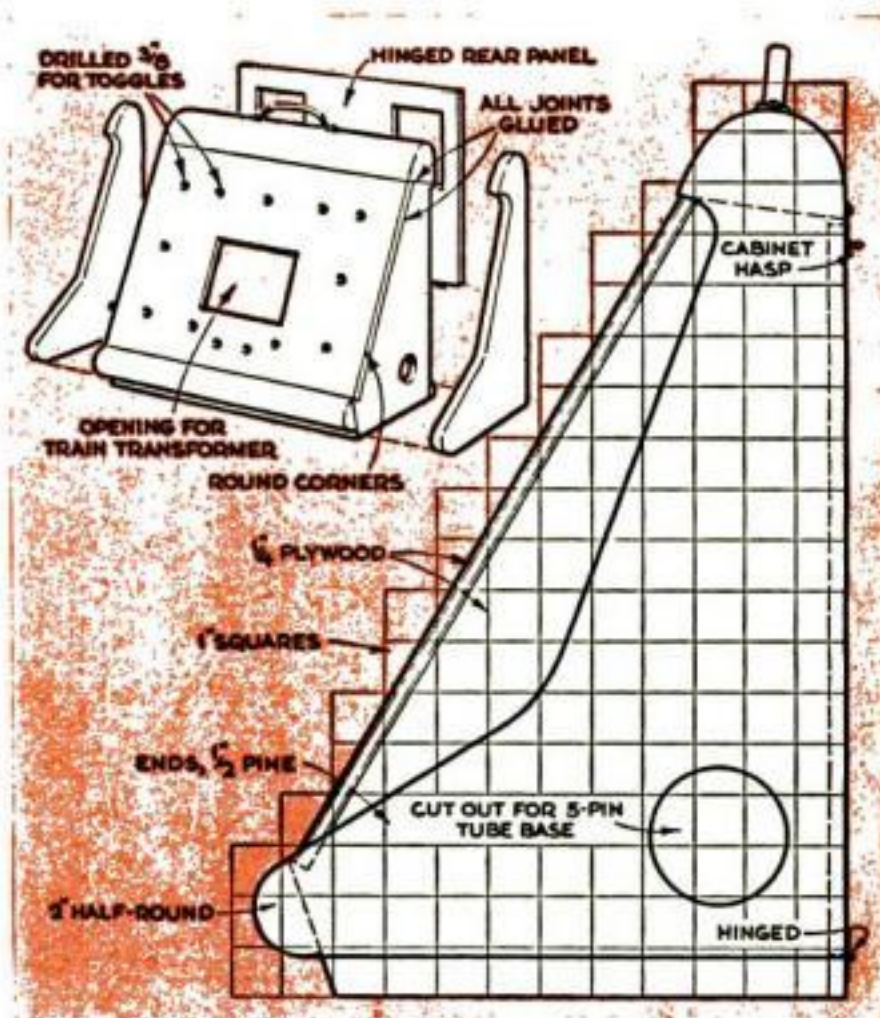
Cabinet. To grace the living room, the cabinet should be more than a box. The one shown was built from scraps of plywood.

Wiring. The drawing on the next page illustrates the wiring arrangement as seen with the hinged back open. From this, you can trace and duplicate the wiring. Line voltage is picked up from a wall outlet and fed to the box by a heavy-duty extension cord.

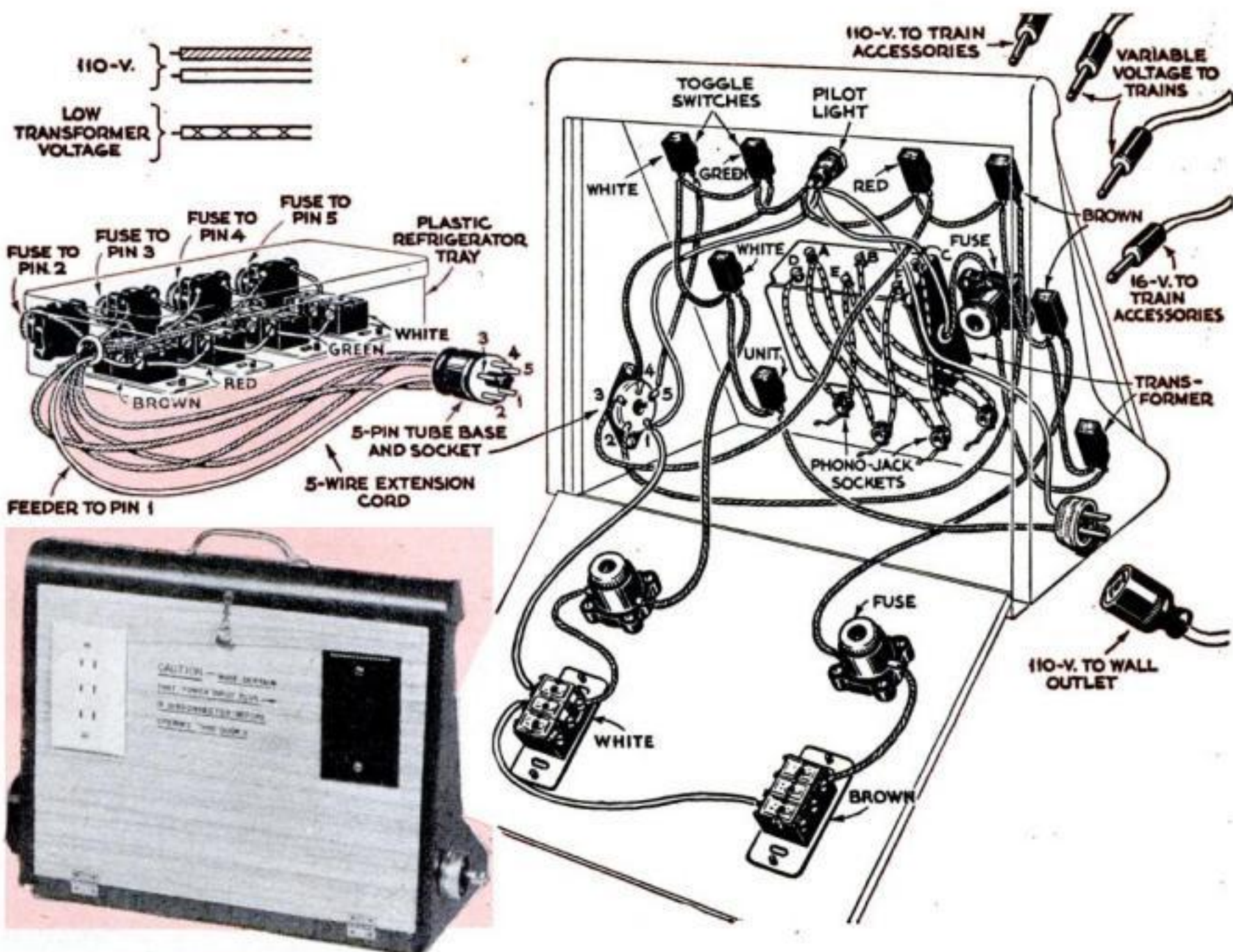
This plugs onto a male plug fitted to the side of the box. Current is then carried to the neon pilot light and toggle switches through radio hookup wire. A five-pin tube base on the opposite side of the box carries current to four triple outlets built into half a plastic food-storage box. A five-conductor cable, long enough to meet your needs, links the outlet box to the control panel. Each

circuit is protected by a five-ampere fuse in a light socket.

Train transformer. This is turned on by a toggle switch on the panel and is also guarded by a fuse. Extensions wired to



CASE for control panel is built of plywood covered with blond-mahogany plastic veneer on face, dark strip mahogany elsewhere. Back is hinged for easy access to wiring.



phono jacks carry variable low voltage to the tracks and fixed low voltage to the buildings and other scenic accessories.

Many interesting effects can be obtained

by running separate circuits of tree lights of different colors to the control board and lighting them in combinations.—James T. Raymond, Emporium, Pa.

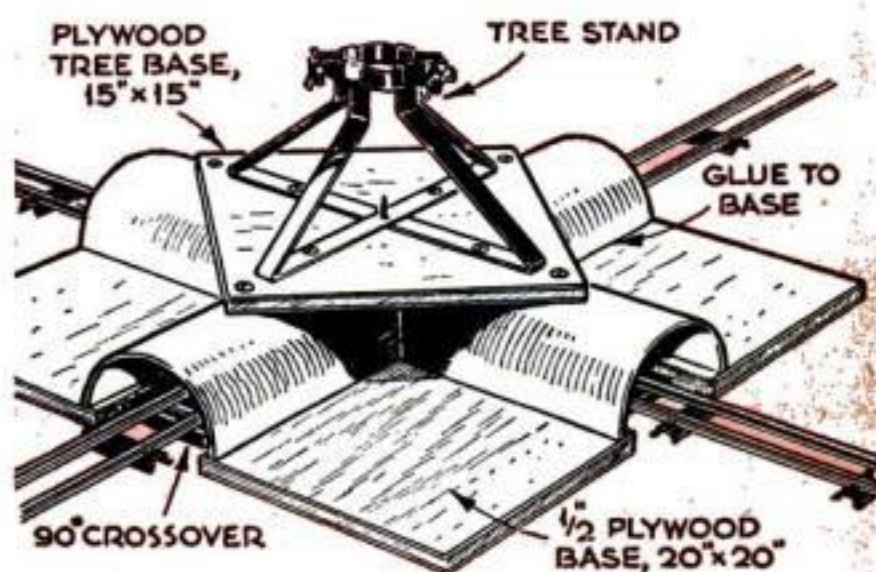
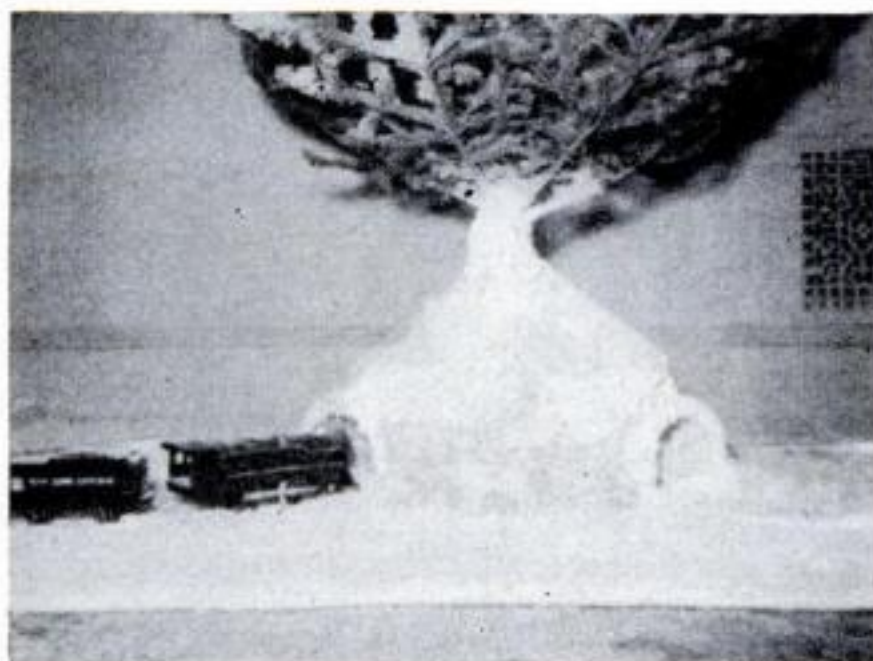
Tunnel for Trains Supports Christmas Tree

THIS four-portal tunnel adds scenic beauty to your Christmas train layout and supports the tree as well.

Backbone of the tunnel is the heavy cardboard tubing rugs are rolled on. Two pieces 20" long are cut and joined to form a double through way that covers a 90° track crossover. This permits trains to run in and out of

the tunnel in a figure-eight layout. A commercial tree stand mounted on a separate base is then screwed to the tubes. The entire structure is covered with chicken wire and plastered over, adding weight.

A coat of canned artificial snow completes the winter setting for the tunnel.—N. A. and B. M. Coomer, Jackson, Mich.



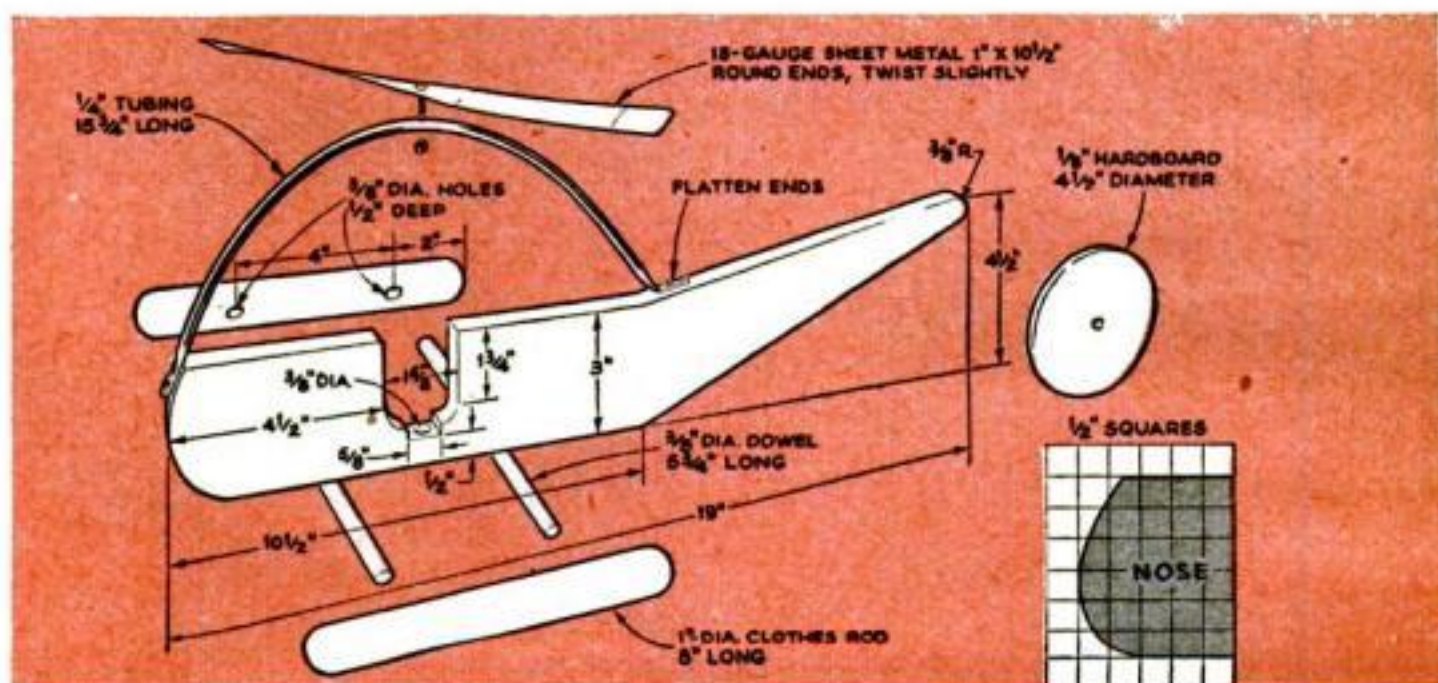
A Project for Christmas



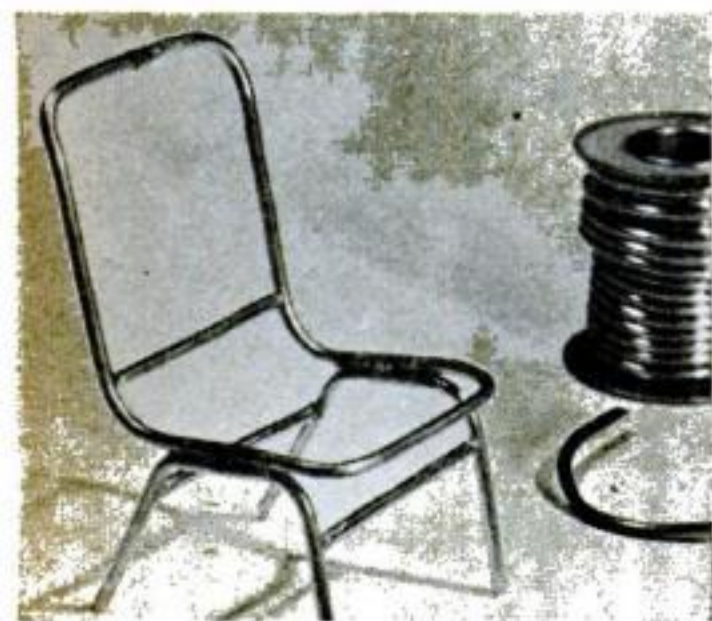
Toy Copter Will Light Up Your Youngster's Bedtime

A NIGHT light that is also a toy helicopter will gladden a young boy's heart. It can be made from scrap wood.

Both the main rotor, fastened with a machine screw and nuts, and the screwed-on tail rotor turn. Shape the fuselage cutout to suit the socket used. A blue or green bulb gives a pleasant light.—Robert H. Hawkins, Morton, Ill.

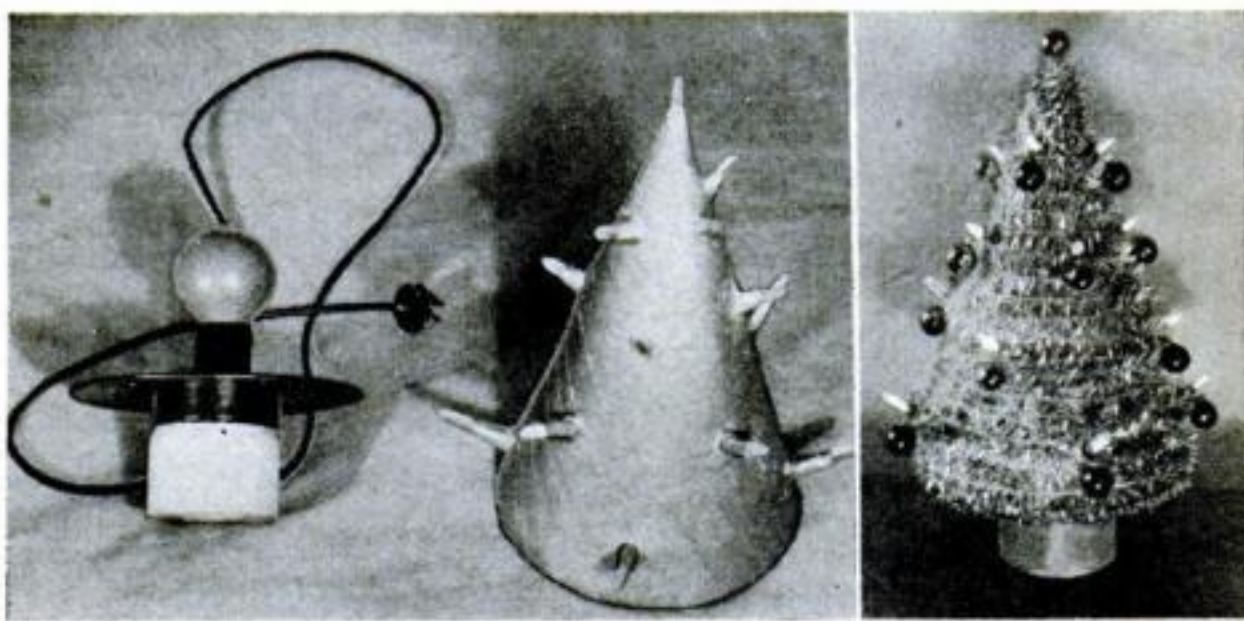


Solder Makes Doll Chairs



IF YOUR daughter insists that her dollhouse would be more attractive with modern wrought-iron furniture, it can be quickly made from solid wire solder. Available in 1/16" and 1/8" diameters, the solder bends easily into any shape. Cellulose tape and household cement make the joints. Cemented-on scraps of fabric provide realistic-looking upholstery.—Richard J. Decker, Brooklyn.

Plastic Pipes Light to Trim Table Tree



THE tiny "lights" that sparkle brilliant color all around this unusual table tree aren't real bulbs at all. They are bits of acrylic plastic rod (Lucite or Plexiglas) which pipe light from an ordinary 40-watt bulb hidden inside the "tree"—a cardboard cone covered with tinsel. The light stays inside the plastic rods, as though in pipes, until it reaches the pointed, roughened ends. Then it emerges, visible, to make the plastic points gleam like tiny bulbs.

The socket for the 40-watt bulb can be mounted on a base improvised from wood scraps. Be sure to provide ventilation holes.—L. Carpenter, Los Angeles.

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Road Map

By Darrell Huff

EVER poked around frantically for a misplaced map while friends wait for you to show them the route? Sure. Chances are some of the people on your Christmas list have, too. Here's a simple, neatly designed table that keeps the map where it can't be lost, right on the table top. And it makes a novel Christmas gift.

The map comes free from a service station. As shown in the pictures at left, you have to vary the shape of the table to fit the shape of the state you want to use. The photographs below show how to build a table for California, Michigan, Massachusetts, Florida or Louisiana, but tables for other states are made in the same way. Any lumber of 1" to 1½" actual thickness will serve.

Redwood or pine will cost you as little as \$2. You can turn out several tables for friends in a few evenings.



Narrow rectangle accommodates:

United States	Vermont	Illinois
Tennessee	New Hampshire	Mississippi
Oklahoma	Delaware	New Jersey
Kentucky	North Carolina	



Wide rectangle accommodates:

Iowa	Washington	Indiana
North Dakota	Oregon	Utah
South Dakota	Connecticut	Missouri
Nebraska	Georgia	Minnesota
Kansas	Alabama	Texas
Montana	Pennsylvania	Colorado



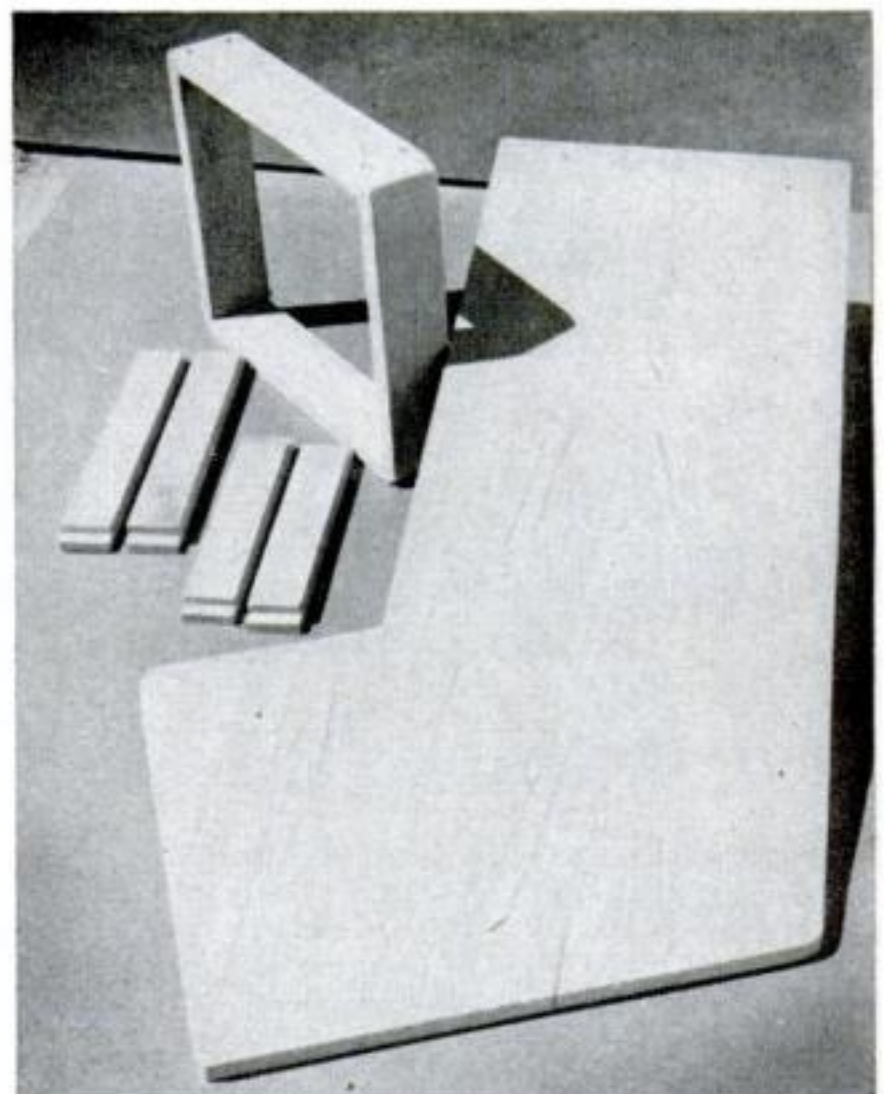
Square accommodates:

Ohio	Rhode Island	Arizona
Maine	Wyoming	New Mexico
Arkansas	West Virginia	Wisconsin



Triangle accommodates:

New York	Nevada	Maryland
Idaho	Virginia	South Carolina

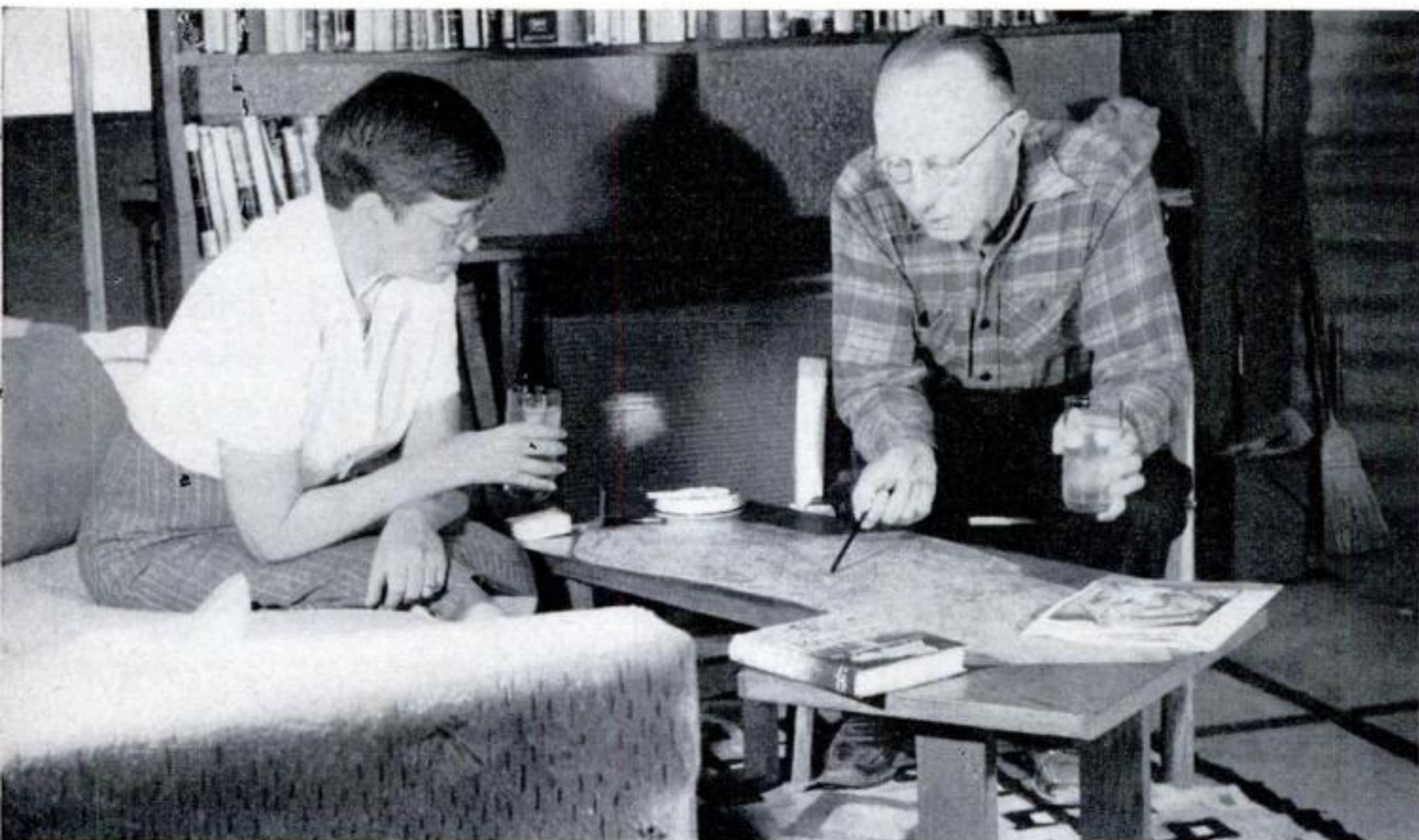


1. GLUED-UP TOP has corrugated fasteners at joints on both sides. Legs are shallow boxes made of rabbeted pieces glued and screwed together. Corners are then rounded.

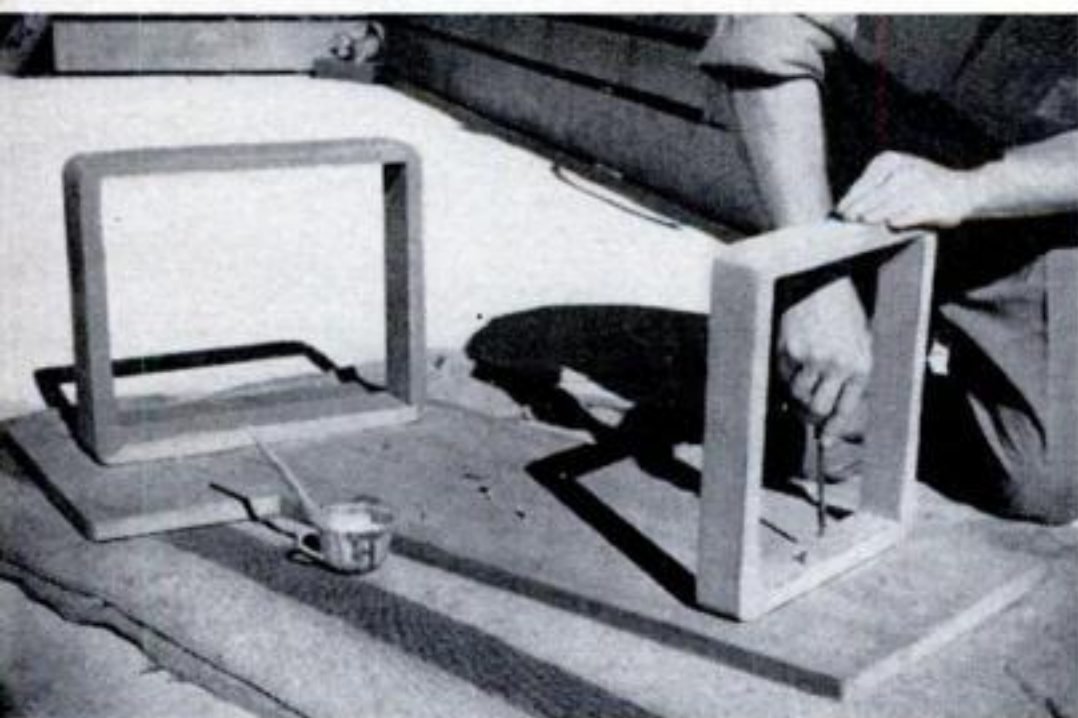
Tops Gift Table

There's no hunting for a map when it's fixed to the table top. Two dollars will build this project—and friends will like it.

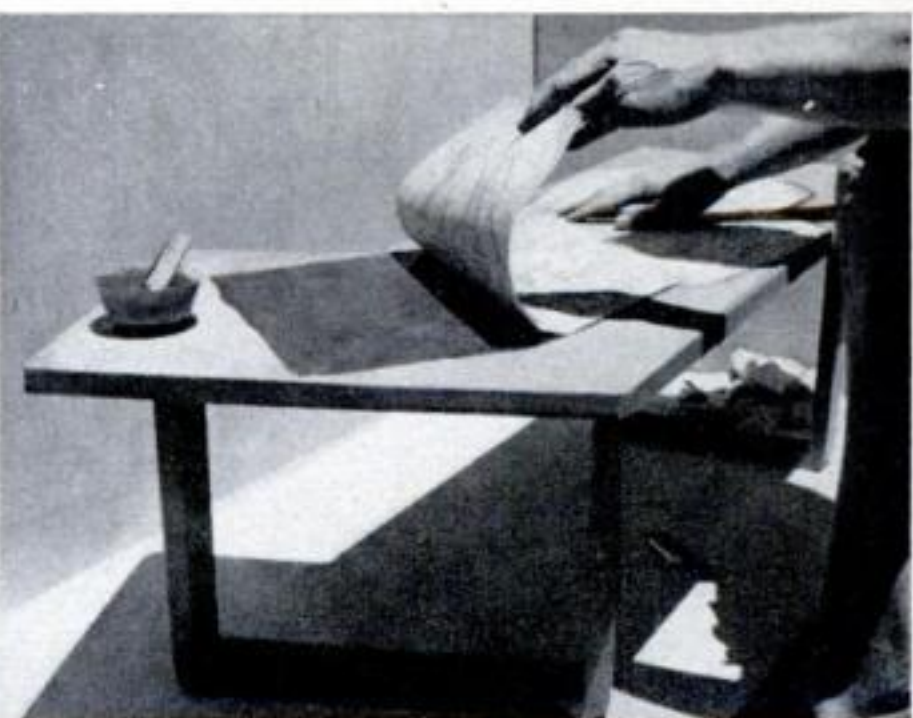
*A Project
for Christmas*



Finished table is handsome enough for the living room, but tough enough to use outdoors.



2. LEGS ARE FASTENED to top with water-resistant glue and screws. For this table, one leg box is 3" by 16 $\frac{3}{4}$ " by 14 $\frac{1}{2}$ "; the other is 2" by 12 $\frac{3}{4}$ " by 14 $\frac{1}{2}$ ".



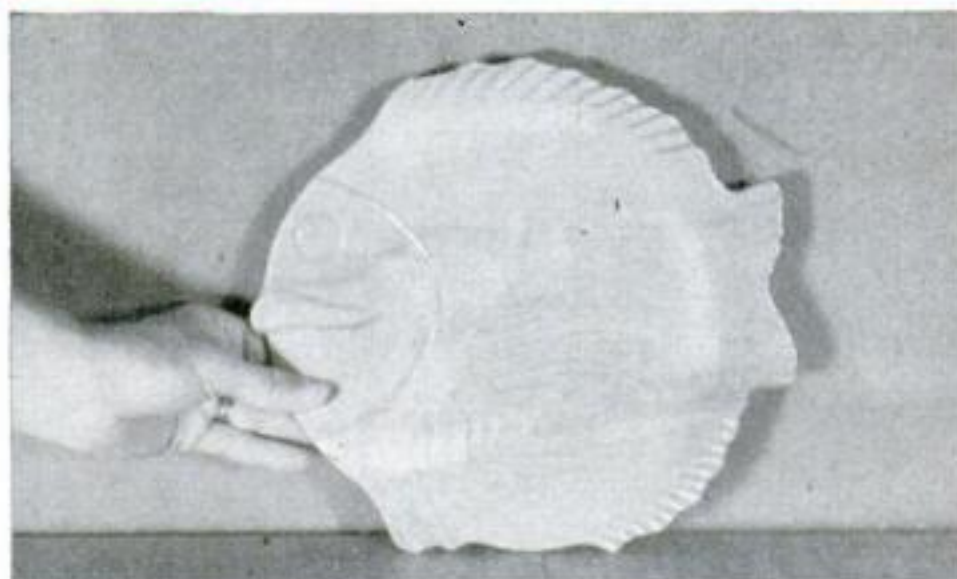
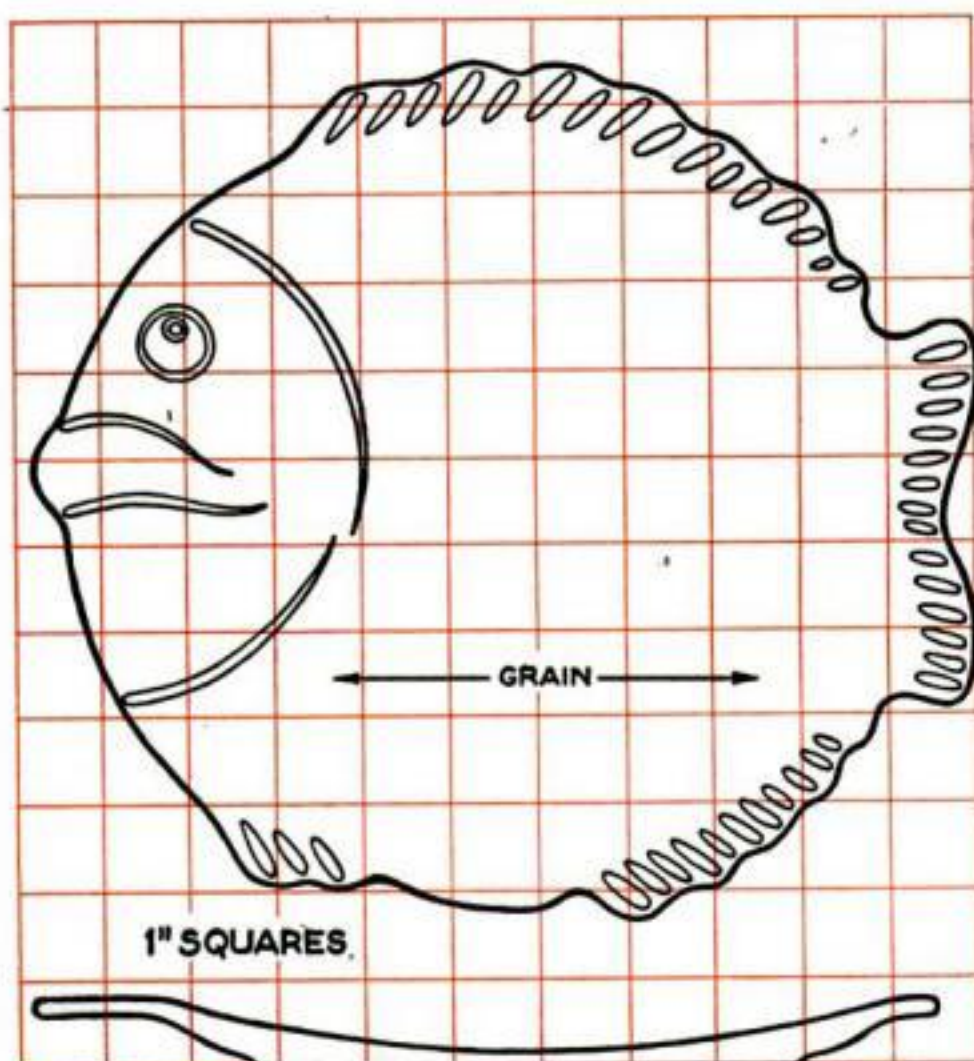
3. MAP IS TRIMMED to outline, glued to top. After glue dries, clean map with sandpaper and feather edge to blend into table top. Clear lacquer finishes table, map and all.

A Project
for Christmas

Wood Fish Makes Snack Plate

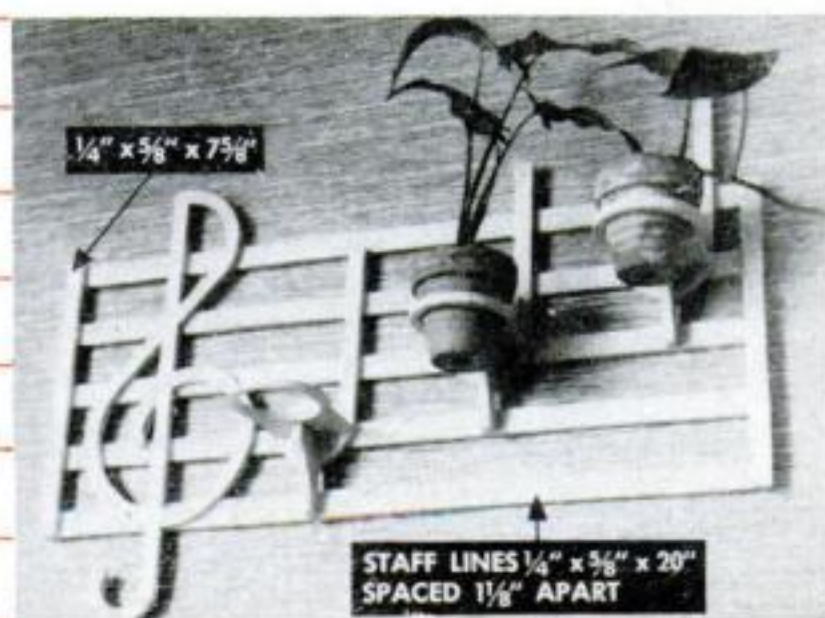
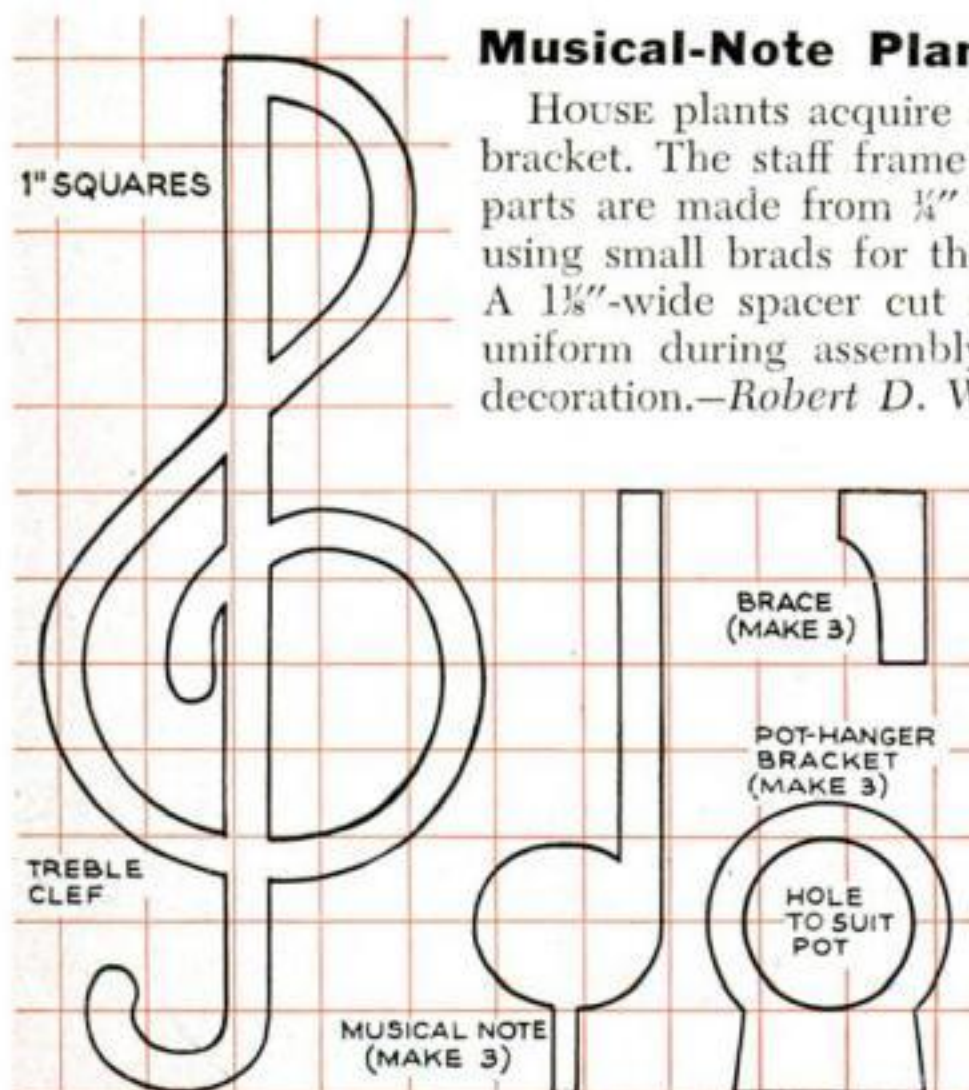
SANDWICHES and cookies are the specialty of this turned-and-carved plate. You need a hardwood block—solid or glued up—1" by 11" by 11", which is turned to make the dish and then sawed to the fish outline. A 4"-square block glued to the back will eliminate faceplate screw holes in the finished job and can be chiseled off later.

The head, fin and tail grooves can be routed or carved with a jackknife. Sand carefully and apply several coats of lacquer.—Vern Forsberg, Seattle.



Musical-Note Planter Tunes to Your Room

HOUSE plants acquire a musical air when set in this simple wall bracket. The staff frame can be any $\frac{1}{4}$ " stock, while the jigsawed parts are made from $\frac{1}{4}$ " plywood. Assemble with glue and brads, using small brads for the frame and $\frac{1}{2}$ " ones for the pot holders. A $1\frac{1}{2}$ "-wide spacer cut from scrap will help keep the staff lines uniform during assembly of the frame. Finish to suit the room decoration.—Robert D. Wray, Worthington, Ohio.



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Wally Cox, TV's Mister Peepers (Sunday nights, NBC-TV) shows one of the aluminum storm windows you can make with Reynolds *Do-It-Yourself* Aluminum. These storm windows... so much easier to make than wooden ones... are permanent, rustproof, attractive, can be made with either glass or plastic panes.

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CANDLE WARMER. All you need is a trivet, three short pieces of copper tubing and a block of wood. Bore holes in wood for tubes, spacing them to suit feet on the trivet.



COOKBOOK HOLDER. This is two pieces of hardboard with a length of one-by-two sandwiched between. Fasten hardboard to narrow edges of wood strip with screws.

A Project

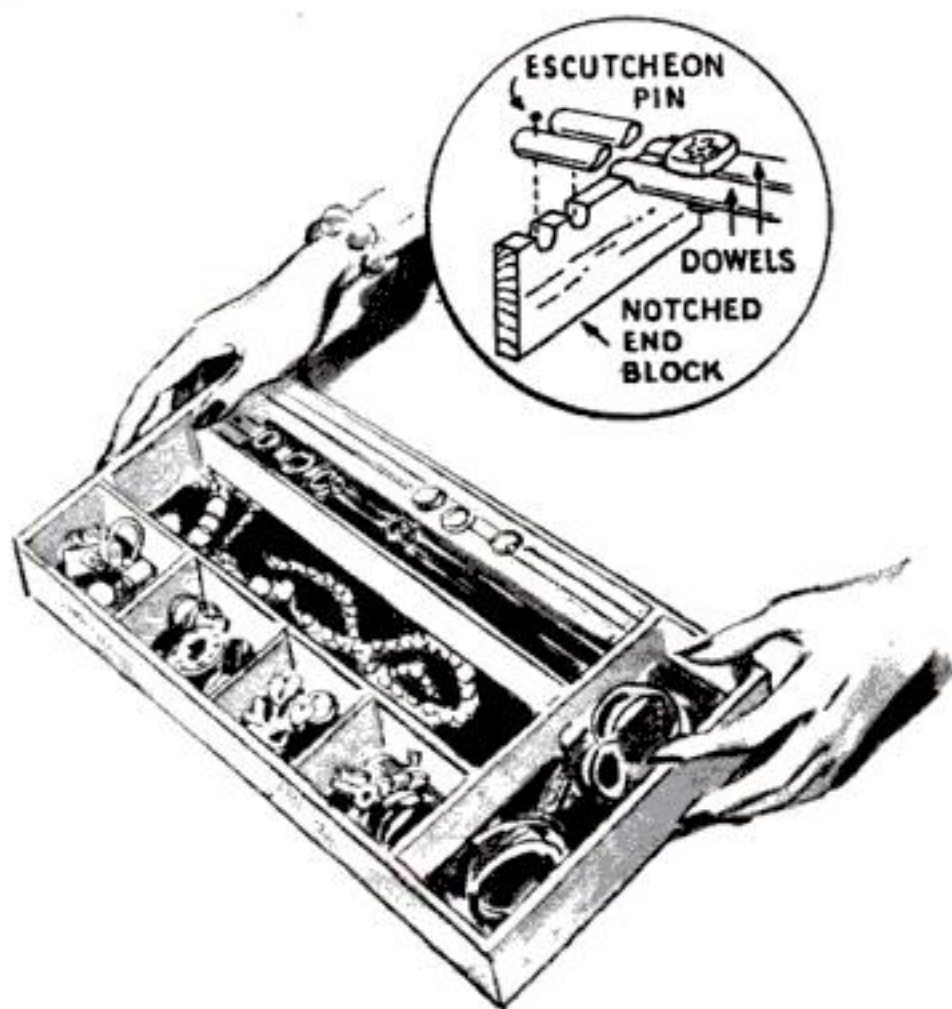
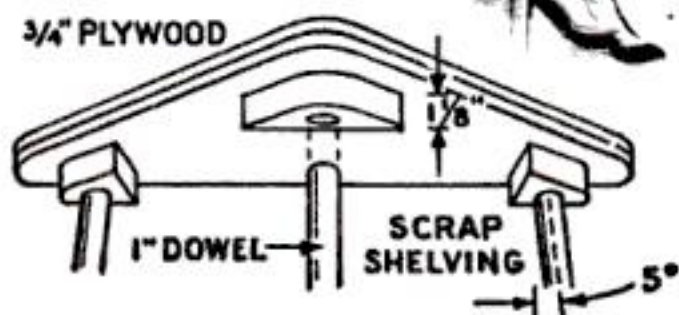


for Christmas

Knickknacks for the Ladies

SNACK TABLE. This store-easy table has legs that pull out. Triangular plywood top is fitted with corner blocks that are drilled at 5° angle to take dowel-rod legs.

JEWELRY TRAY. Make it from a wood knife box. Wood dividers nailed in one section form compartments, and two pairs of dowel rods placed together make earring rack.



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Build the One-Motor **DELTA SHOP** A TOOL AT A TIME

Now you can get the wonderful one-motor DELTASHOP on a year-around gift plan.

You can start with the saw this Christmas and add the other tools throughout the year. Ask your family to start you on the Deltashop "Add-a-Tool" gift plan this Christmas, or start yourself and let the family take it from there.

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The circular saw and stand for Xmas. A Delta Home-craft quality saw—with an 8-inch tilting blade—handles every sawing job for your "do-it-yourself" home projects.

Saw and stand only . . . \$109.80

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Package 3

Comes the drill press for the birthday or Father's Day—a Home-craft 11" drill press, none finer.

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11" Drill Press, only...\$57.50

Package 4

Finally the sander, a most versatile tool—puts a professional finish on wood surfaces; also can be used to grind, buff, polish—a real handyman tool.

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The DELTASHOP is a complete home-workshop that does 95% of home do-it-yourself projects, occupies only a 3-foot square, and pays for itself quickly by savings on home repairs and improvements. Keep it anywhere, move it anywhere, use it anywhere, indoors or out.

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Also send for catalog of famous Delta "How to do it" books. Delta Power Tool Division, Rockwell Manufacturing Company, 504M North Lexington Avenue • Pittsburgh 8, Pennsylvania.

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DELTA QUALITY POWER TOOLS

Another Product of **Rockwell**



DELTA QUALITY MAKES THE DIFFERENCE

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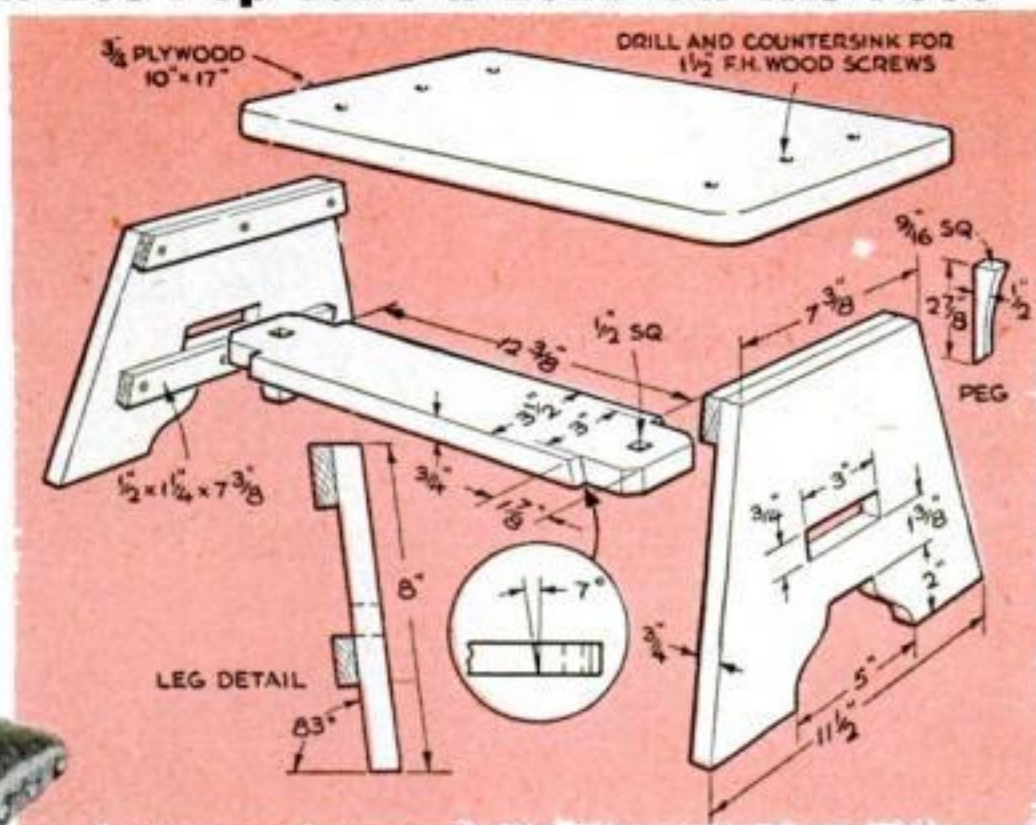
Easy-to-Build Footstool Will Let Pop Take a Load Off His Feet

*A Project
for Christmas*



Pop's going to be pretty tired by nightfall Christmas Day. He'll be glad to put his feet up on this handsome footstool. And making it is pretty simple. Fir plywood scrap will do for the top, and almost any $\frac{3}{4}$ " solid stock can be used for the rest.

Make a cardboard template for the ends



so that they will be exactly alike. The scroll on the bottom will have to be done on the jigsaw. To saw out the mortises for the stretcher, drill starting holes, then tilt the jigsaw 83° . Drill holes for the pegs, squaring them with a chisel. Cut and attach the $\frac{1}{2}$ " cross strips with glue and screws. Two coats of orange shellac, each rubbed down with fine steel wool, will give a natural finish.

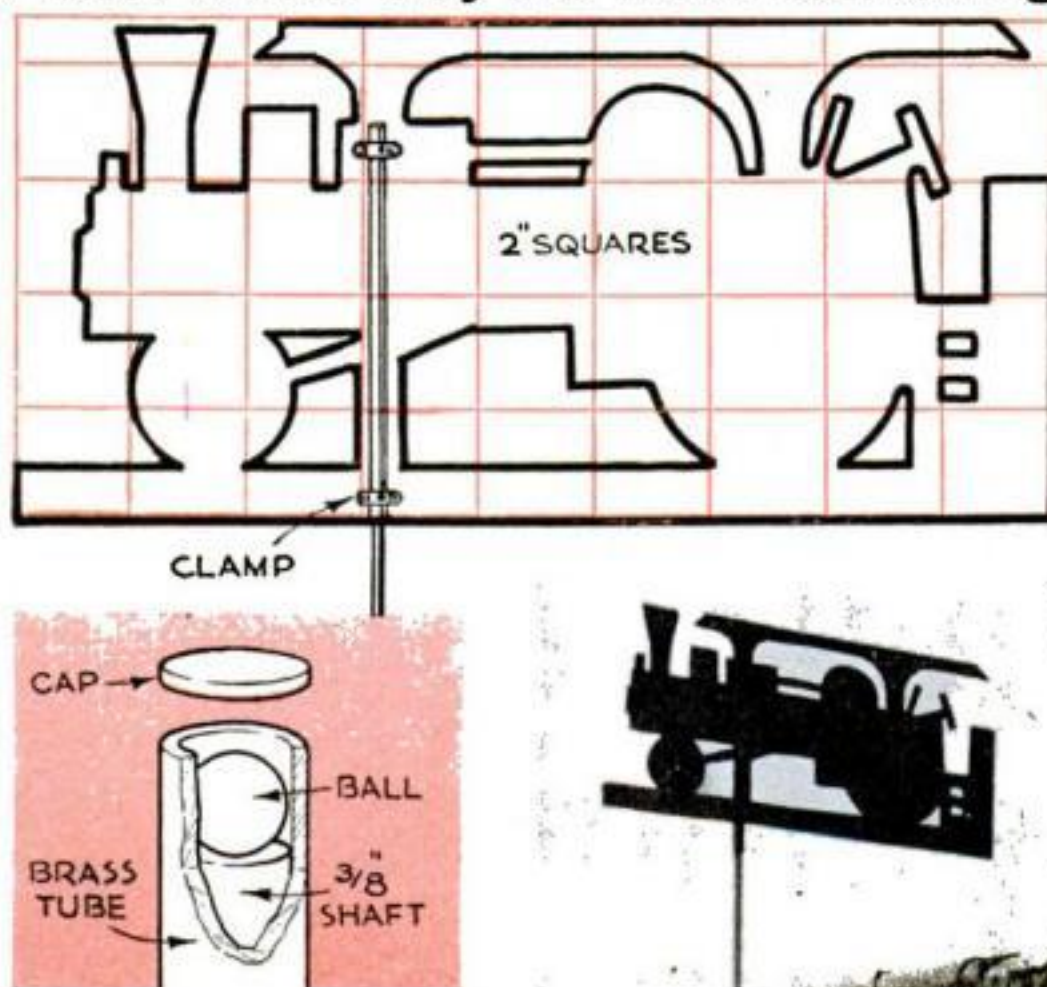
Cover the top with a 13"-by-21" piece of leatherette over a $1\frac{1}{2}$ " layer of upholsterer's cotton. Tack the plastic to the underside with carpet tacks, then add decorator's tacks around the edge.

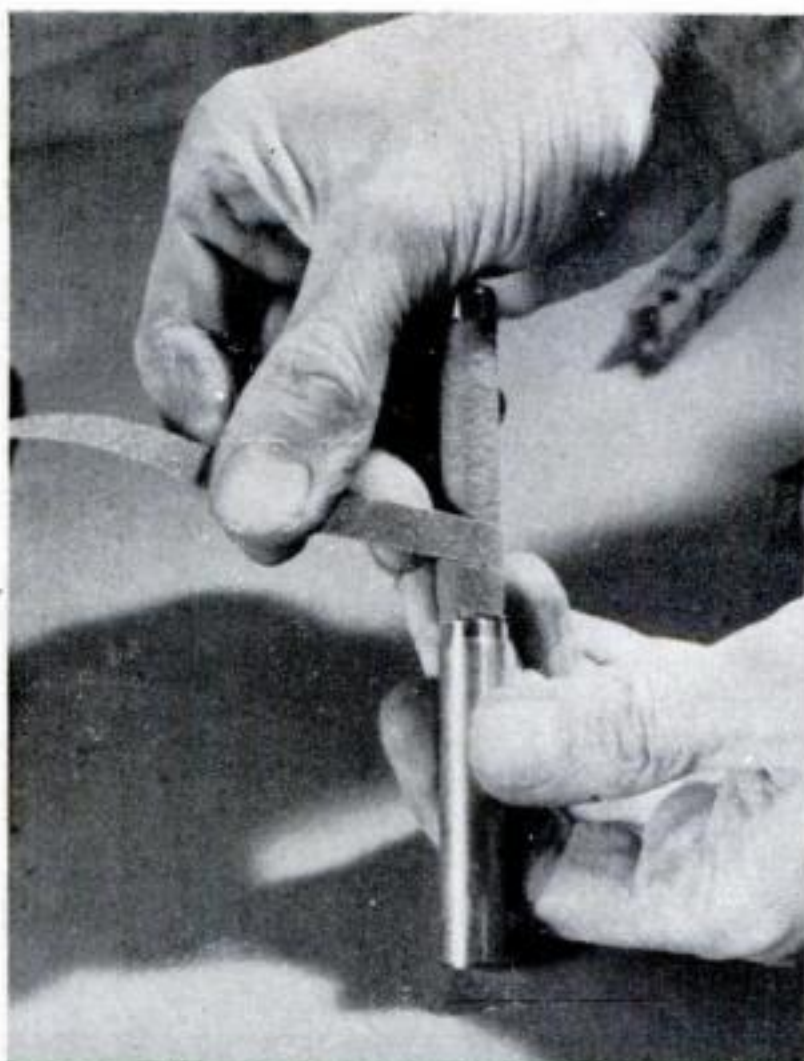
Old Steam Traction Engine Tells Which Way the Wind Is Blowing

STEAM traction engines, once plowed the soil and threshed our grain, clanking from farm to farm between jobs. This weather vane brings back memories of those awkward but fascinating machines.

Transfer the pattern by means of a grid to a sheet of fairly stiff copper, aluminum or galvanized iron. Cut to shape with shears, a metal-cutting coping saw, or hammer and chisel.

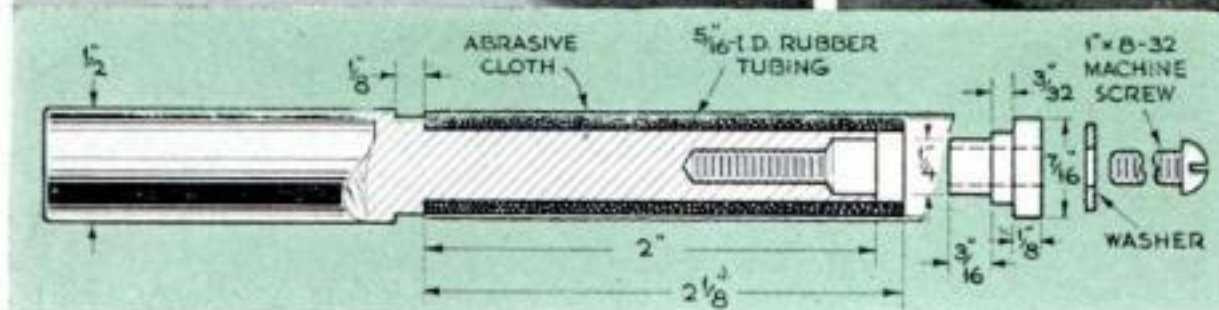
Solder or clamp the vane on a bearing tube as shown in the drawing. Grease and slip the tube onto a firmly mounted shaft, with a steel ball as a thrust bearing. Compass points can be bent from wire or cut out from a piece of sheet stock if desired.



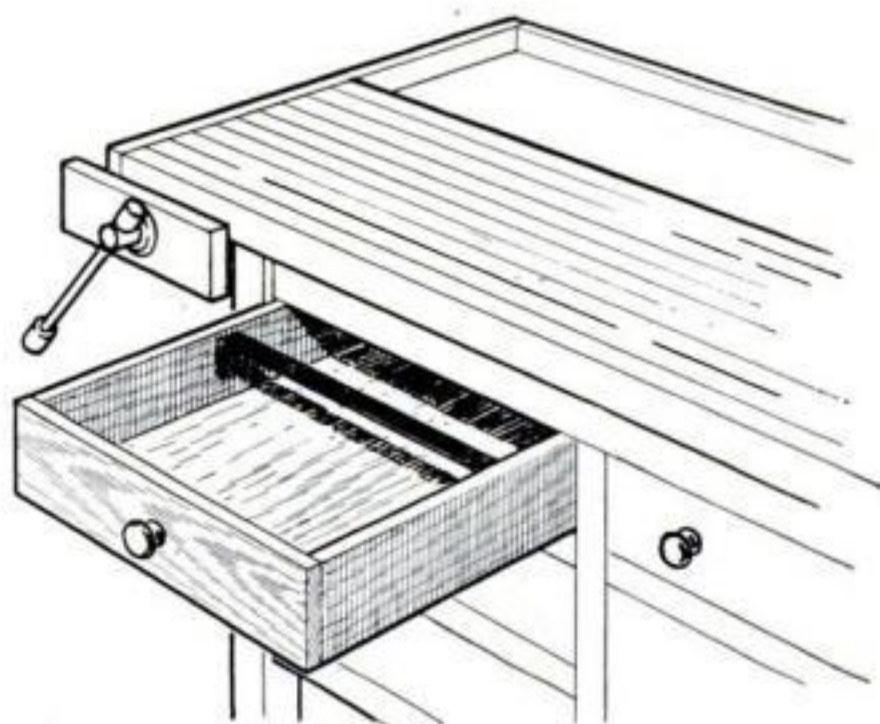
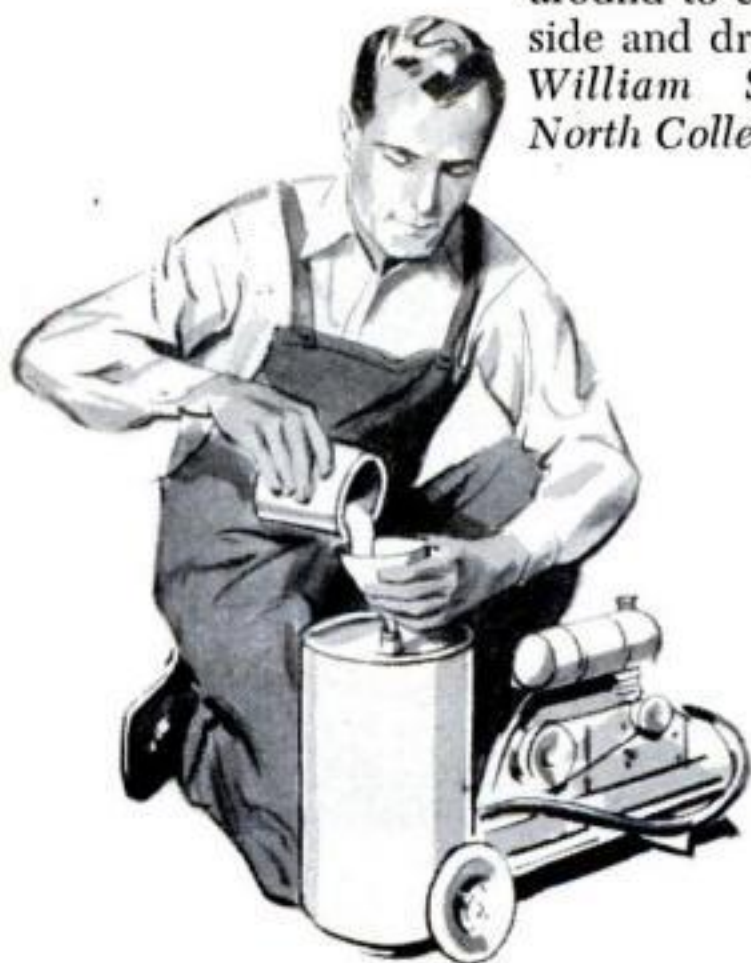


NEW Shop Ideas

Sanding Spindle. A strip of abrasive cloth about $\frac{5}{16}$ " wide wrapped around this drill-press attachment forms a sanding spindle for inside curves. The strip is started by wrapping it over itself at the shank end, completed and secured at the bottom under a washer held tight by a machine screw. The strip must be wrapped from right to left so that it won't unravel in use. Removable sleeves can be made by gluing strips over heavy paper.



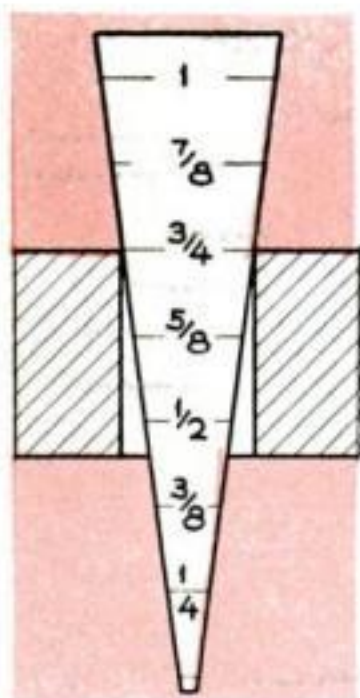
Paint Lines Compressor Tank. Condensation is your compressor tank's worst enemy. It settles at the bottom and slowly rusts the tank away from the inside. Once the rust has started there's little you can do about it, but if your outfit is fairly new, you can protect it by pouring good enamel or thinned red lead in the tank, sloshing it around to coat the inside and draining it.—*William Schluter, North College Hill, O.*



Bench Drawer Goes to Job. A small handle built into the center of your workbench drawers permits you to haul them out and carry them to jobs outside the shop.

Spaghetti Extends Oil Spout. To oil hard-to-reach working parts of shop machinery, extend the spout of your squirt oilcan by slipping on a length of insulating spaghetti. This plastic tubing is available at radio-supply and hardware stores. Pick a size to fit the oilcan spout.

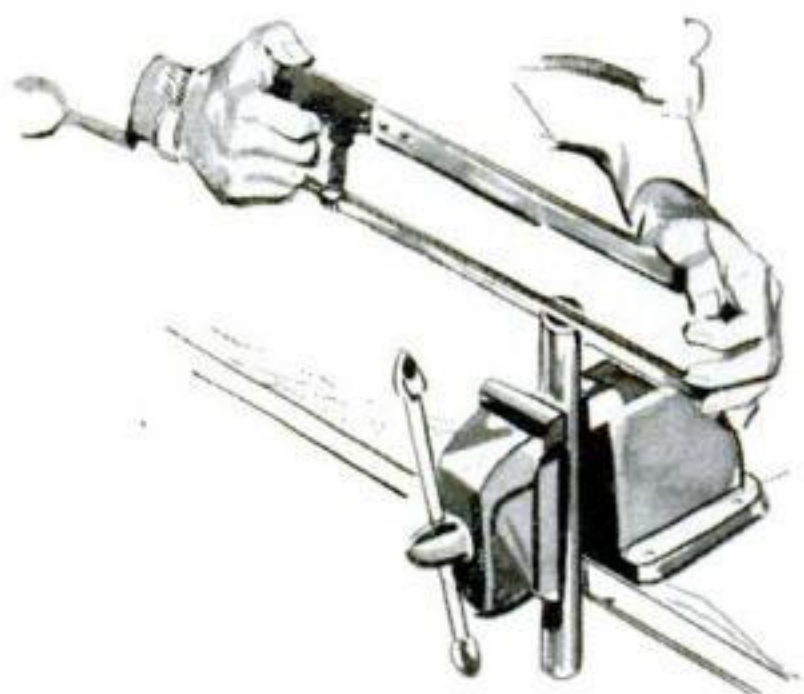
MORE SHOP TIPS



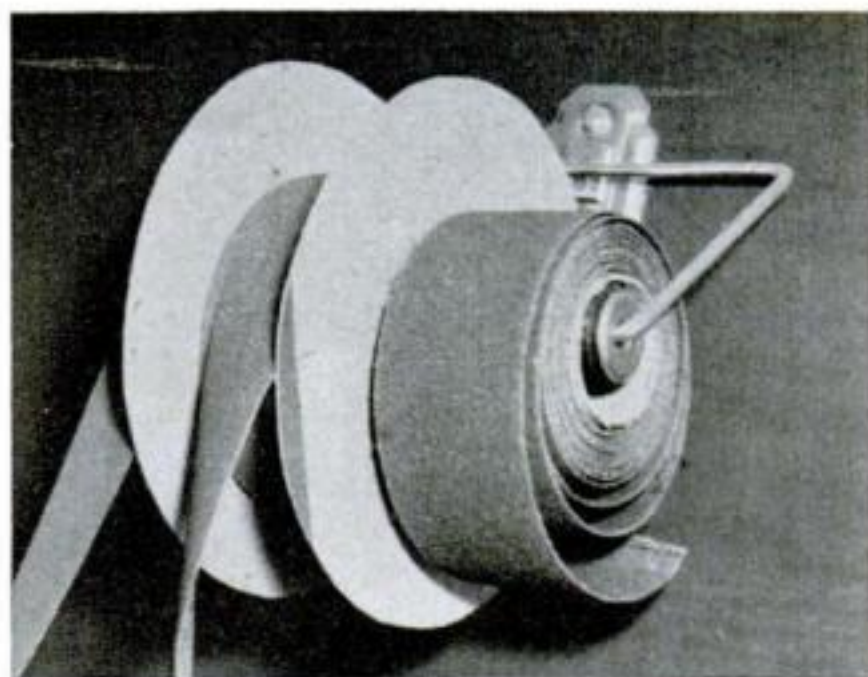
Gauge Measures Holes. Thin flat steel cut to a taper of 2" to the foot (about $9\frac{1}{2}^\circ$ included angle) makes a gauge for checking the diameter of holes. After cutting the blank, measure the various widths of the taper and mark it off by eighths or sixteenths. Less taper increases accuracy.—*Federico Strasser, Santiago, Chile.*



Frozen Rubber Machines Easily. Sawing, cutting or machining soft rubber to form small parts usually results in a hacked-out job. Your troubles are over, however, if you freeze the rubber in a home freezer. It will then be hard enough to be drilled—even turned—without difficulty, and the finished product has the appearance of a molded part.—*Burns Hansen, Salt Lake City.*

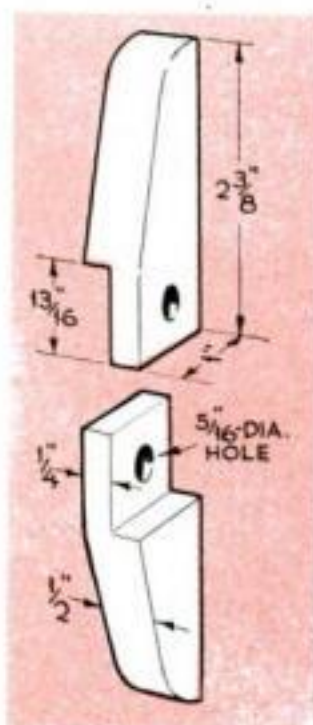


Saw Blades Cut Wide Slots. Three hacksaw blades side by side will cut a neat slot $\frac{1}{8}$ " wide. Light filing smooths the bottom. Other widths can be obtained by joining two, four or more blades.—*William H. Eichhorn Jr., Highland, N. Y.*



Tissue Holder Stores Emery Strips. Compact storage and easy selection of the grit needed for a job are the chief advantages of mounting rolls of abrasive strips on a toilet-tissue holder. You can pull out and tear off the length you need.

Two-Piece Lock Is Tamperproof. The usual tool-chest lock is easy prey for a heavy screwdriver. This two-piece arrangement cut from $\frac{1}{2}$ " steel is attached from inside with machine screws. A husky padlock slipped through the mating holes provides real security.—*G. W. Hall, Brooklyn.*



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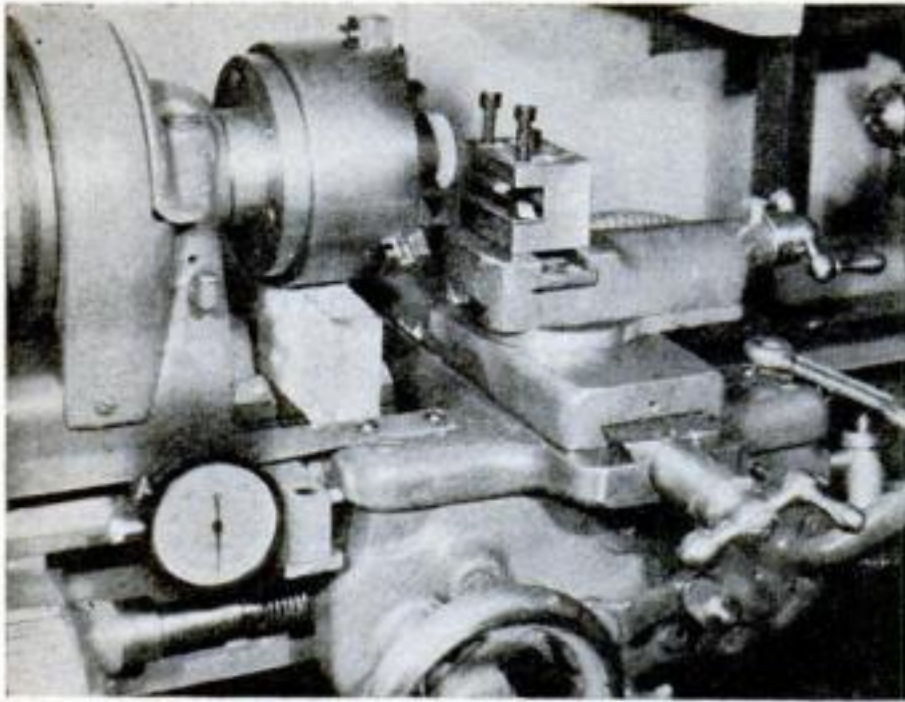
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BLOCK OF WOOD, wedged lightly between chuck and lathe bed acts as brake to eliminate backlash. Indicator must be set at zero on first cut to utilize full .250" of stem travel, otherwise it must be reset to finish job.

Dial Indicator Graduates Collars in Lathe

EVEN if your lathe has provision for indexing (and many lathes do not), cutting fine graduations on a collar or dial can be a mean job. Here's a setup that skips the indexing and lets a dial indicator relieve you of the eyestrain.

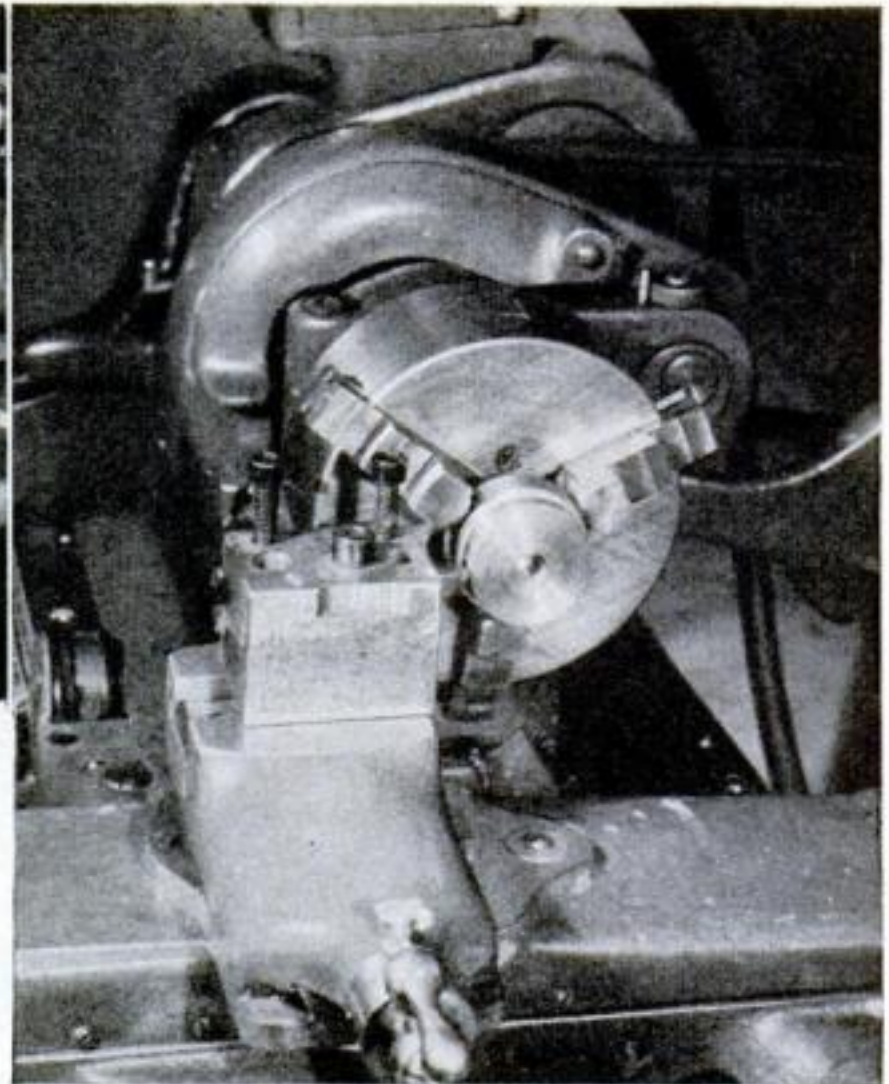
Clamp the dial indicator to the lathe bed and set the lead-screw gears to feed the carriage four threads per inch. This gear train will advance the carriage $\frac{1}{4}$ " (.250") with each revolution of the spindle. The .250" of carriage travel can then be accurately indexed with the readings on the dial indicator.

If, for example, you're making a dial for use with an 8-t.p.i. screw, 125 graduations are needed. As each .001" on the indicator is equal to $\frac{1}{250}$ of a full spindle turn, cutting a mark at each .002" will produce 125 graduations on your homemade collar.

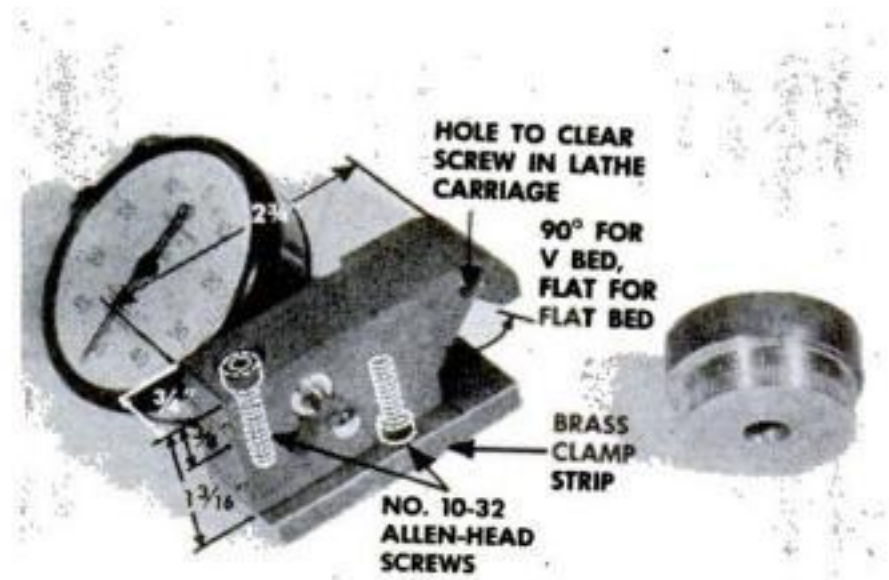
Cut the marks by advancing the compound to move a V-shaped cutter clamped on its side across the surface of the collar. Back it off, rotate the spindle to the next .002" and advance the compound for the next cut. Depth of cut is established by the cross-feed. Chalk the work and scribe two light lines to limit the length of the marks; every fifth one made longer. Stamp appropriate numbers over each of the longer graduations.

The most common feed-screw-and-collar combinations are:

Screw 40 t.p.i., collar 25 graduations, used on American micrometer; screw 10



HERE'S A TYPICAL COLLAR cut with dial-indicator indexing setup. Graduations are cut about .005" deep and every fifth one is longer. Numbers are stamped beside long marks.



INDICATOR BRACKET is cut from block of red fiber; hardwood or brass could be used. Stem of indicator is clamped in slotted hole running parallel with lathe bed. Dial at right is $1\frac{1}{2}$ " diameter, with 125 graduations.

t.p.i., collar 100 graduations, used on lathe cross-feed and compound; screw 8 t.p.i., collar 125 graduations, used on milling-machine feeds.—*Bernard J. Corey, Thorold, Ont.*

Photo Labels Can't Smear

LABELS on jugs of photo chemicals won't become messy and illegible if you cut the labels off the cans the chemicals came in and fasten the metal strips around the necks of the jugs.—*R. C. Blomberg, St. Paul.*

◇◇◇ 3rd of a Series

**What every
Automobile man
should know about**

Power Steering

The fastest-growing innovation in automotive history is Power Steering—and the leader in Power Steering is SAGINAW, world's largest producer of steering gears. Saginaw Power Steering is now available on all General Motors cars and three other well-known makes. Nearly 600,000 new cars have been equipped with it—more than all other types combined. So naturally, many people wonder:



6. HOW DOES SAGINAW POWER STEERING OPERATE?

Basically, it is simply a highly efficient recirculating Ball Nut Steering Gear with a built-in hydraulic assist. This consists of a pump which delivers oil at 750 pounds per square inch, a reservoir, a double-acting hydraulic cylinder, and an ingenious spool-type control valve, as shown in simplified Diagram 1.

The spool valve, part of the steering shaft, is a grooved cylinder machined to a sliding fit within the grooved valve housing. The spool revolves with the steering shaft, can slide forward or backward about .060" and still retain the high-pressure oil. Whenever *less* than three pounds pull on the steering wheel is needed, the valve remains in "neutral" position, as shown in Diagram 1, and the circulating oil by-passes the power cylinder. *No hydraulic force whatever is applied to the steering mechanism*, and the car remains completely under manual control.

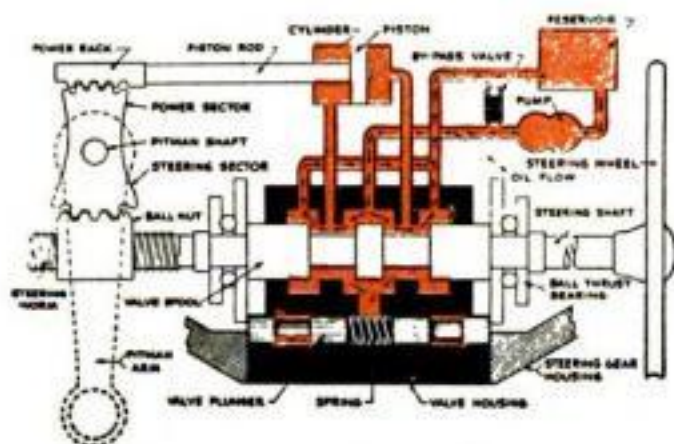


Diagram 1

This assures the "feel of the road" SAFETY ZONE which distinguishes Saginaw Power Steering from ordinary types.

However, as soon as *more* than three pounds pull is needed, the resistance of the wheels causes the ball-nut and screw assembly to act as a jack. If the turn is to the *left*, this forces the whole steering shaft, including the valve spool, imperceptibly *toward* the driver, as shown in Diagram 2. This changes the course of the oil, so it now flows to the front of the power cylinder and forces the piston backward. Power assistance is thus applied to the pitman arm, to help turn the wheels to the left. At the same time, oil pressure on the valve plungers tends to move the steering shaft and spool back to neutral position, which cuts off the flow of oil to the power cylinder.

When the steering wheel is turned to the *right*, the spool moves slightly *away* from the driver. The oil flows to the opposite end of the power cylinder and forces the piston to assist in turning the front wheels to the right.

The whole system also acts in reverse to resist any force, such as a blowout, which tends to twist the wheel from the driver's hands. When a road shock is transmitted through the pitman arm, the resulting movement of the valve spool admits oil to the proper side of the power cylinder to counteract the shock. Note, too, that a by-pass valve is provided which opens in case of pump failure, so there is no resistance to manual steering.

IF YOU'D LIKE TO LEARN MORE—we'll be delighted to send you "THE FACTS ABOUT POWER STEERING."

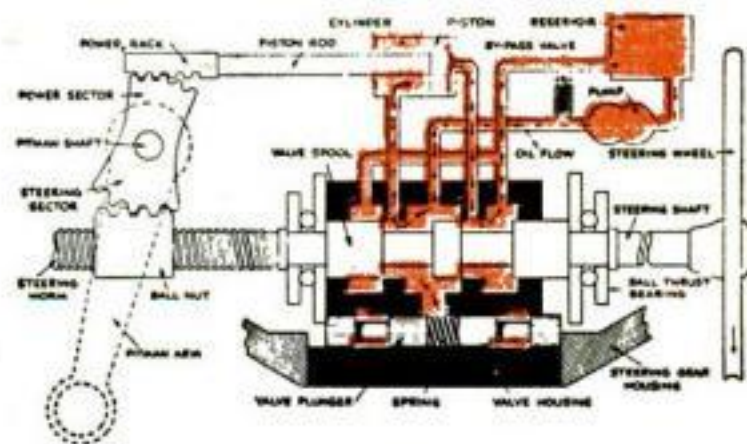


Diagram 2

Saginaw Steering Gear Division
General Motors Corporation
Saginaw, Michigan (Dept. S)

Please send a free copy of "The Facts About Power Steering."



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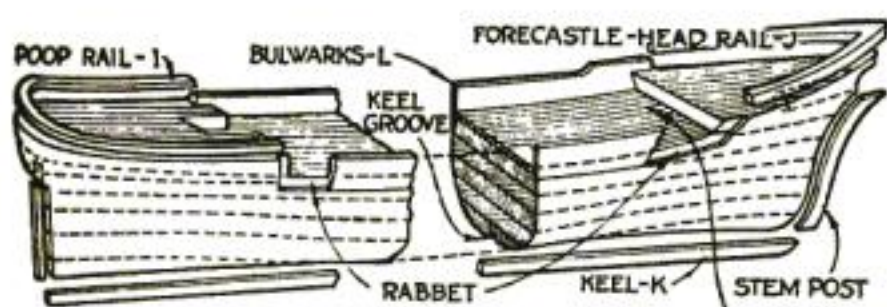
CITY _____ ZONE _____ STATE _____

Saginaw

POWER STEERING

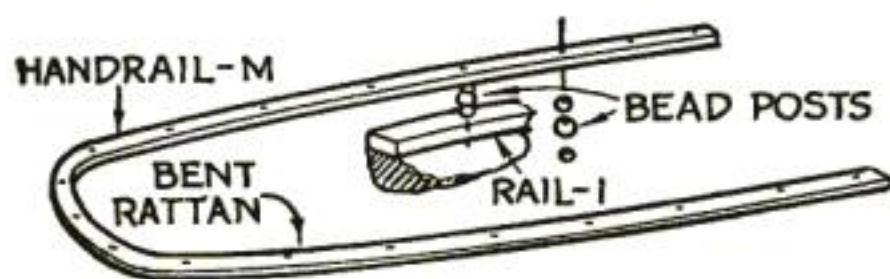
World's Fastest Clipper Ship

[Continued from page 204]



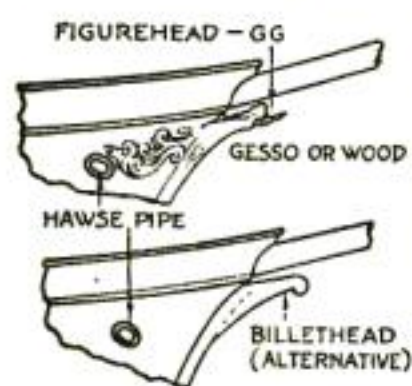
The poop rail is cut from $\frac{1}{8}$ " pine and the forecastlehead rail from $\frac{3}{16}$ " pine. Both are glued on oversize and then sanded down to the proper flare. The poop handrail is a slim strip of rattan cane with beads for posts glued onto straight pins at $\frac{1}{4}$ " intervals.

The keel, stempost and sternpost are $\frac{1}{8}$ "



hardwood and are glued on next. The two moldings that encircle the ship at the upper and lower edges of the bulwarks are half-round rattan sanded down to about $\frac{1}{32}$ " thick after they are glued on the hull.

Bowsprit and bumpkins. The bowsprit fits into a $\frac{1}{4}$ " hole drilled in the bow. The figurehead that goes below it can be a wood carving or simply a wood curl, called a billethead, as shown at left below.



The catheads and bumpkins are $\frac{1}{8}$ "-square hardwood. Drill holes in the rails for them, file the edges square, and nail the pieces to the deck. Bore $\frac{3}{16}$ " holes for the hawsepipes, and

nail on the rudder, thinning it slightly from $\frac{1}{8}$ " at the sternpost toward the after edge. Bore the four $\frac{3}{32}$ " holes in the bulwarks, and glue on the $\frac{1}{8}$ "-by- $\frac{3}{16}$ " channels. The mizzen channels are $1\frac{1}{8}$ " long, the others $2\frac{1}{4}$ ".

Painting the hull. Give the decks two coats of shellac, rubbed down with steel wool and then waxed. The inside of rails, bulwarks and ends of forecastle and poop are white, the hawsepipes red.

Before painting the outside of the hull, drill all holes for masts, bitts, capstan and other deck fittings, and insert deck staples, made of bent pins with their heads cut off.

Prime the hull first with flat white, sand smooth and mark on the water line. Then paint the bottom copper, with a flat grayish-green stippled or wiped on over it. Above the water line is dull black, with a white bowsprit and figurehead.

Deck fittings. Deck houses, skylights, hatches, companionways and binnacle are all blocks of wood with tops glued on and painted white. Their size and window arrangements are shown on the deck plan.

The wheelbox and top of the binnacle are mahogany. Doors and windows are painted on in reddish brown. Bitts, fife rails, boats and skids are white, windlass bitts white or natural, capstan and galley funnel black, and ladders natural. The rigging for the life-

boats is shown at left, and the boats are painted white.

The anchors, capstan, brass bell, wheel, tackle blocks and rigging cord can all be bought at hobby shops. The chain used should be 32- or 36-link, painted black.

Masts and yards. Make the masts of birch or maple and the yards of black walnut or other dark wood, as the *Sovereign's* yards were black. You can use dowels, sanded to a taper, or shape the pieces as shown in the photos.

The heads of the lower masts and heels of the upper masts are all squared off to fit in the tops, caps and crosstrees that splice the mast sections together. Cut the tops, caps and crosstrees from $\frac{1}{16}$ " plastic or hardwood veneer, drilling all holes for masts, shrouds, lower-yard trusses, futtocks, halyards and lifts. The delicate caps should be made oversize, then drilled before trimming to final shape.

Starting the rigging. Begin at the bowsprit, mounting the chain bobstays and shrouds first, then the martingale, as shown on the full rigging plan. The jib-boom guys are black button thread. The head stays are mounted after the foremast is in place. Give the outer end of the jib boom a coat of orange shellac.

You're now ready to set up the masts. Start at the lower masts, gluing them in place, then slip on the tops and fit the topmasts into these. The lower masts are

[Continued on page 234]

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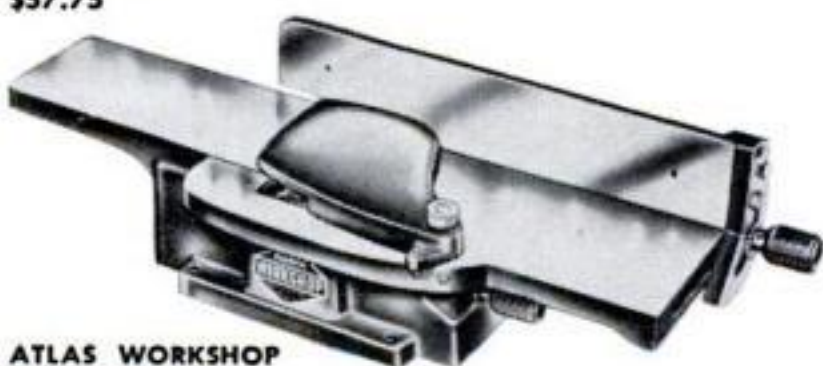
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[Continued from page 232]

painted white to the caps, and the topmasts orange shellac from the caps up.

Setting up the shrouds. These are black cord about 1/32" in diameter for the foremast and mainmast and a bit smaller for the mizzenmast. The shrouds are made in pairs. Run a length of cord from below the channels on one side, up through the top and around the mast, then back down on the same side. The next pair goes on the opposite side, and so on until there are three pairs on each side. The ends of these are tightly secured to tiny pins driven into the hull below the channels. The backstays run through the same channels and are fastened to similar pins.

The ratlines that form the footholds for climbing the rigging are No. 50 mercerized cotton, woven in and out across the shrouds and spaced about 1/4" apart. Put a spot of glue at each end shroud to hold the ratlines in place and snip the excess cord off close.

When all lower shrouds are on, slip on the topmast yards, mount the crosstrees and begin rigging the topmast shrouds. These are of slightly lighter cord than the lower shrouds and are threaded on as a single piece. Start at the head of the topmast and run the cord down between the crosstrees, through the first hole in the top, through the hole in the lower mast, up through the hole in the other side of the top, back up to the crosstrees and down again to the second hole in the top, and so on until you have three shrouds on each side of the mast.

Now repeat the process for the topgallant masts, fitting their heels into the crosstrees, slipping on the upper yards and setting up the shrouds in the same way. The spreaders for the backstays are 1 1/4" needles tied to the stays with their points pushed under the shroud loops on the crosstrees.

Running rigging. These lines are ecru instead of black. Use No. 60 crochet cotton for the lower and topsails, No. 50 thread for the upper yards.

The topsail halyards have a 3/8" double block at the top and a single one at the bottom with a hook. The following sketch shows how the blocks are rigged. The topgallant halyards are similar except that they have a single block at the top and are anchored to the opposite side of the deck. The royal halyards have a single block at the top and none at the deck staple. The

[Continued on page 236]

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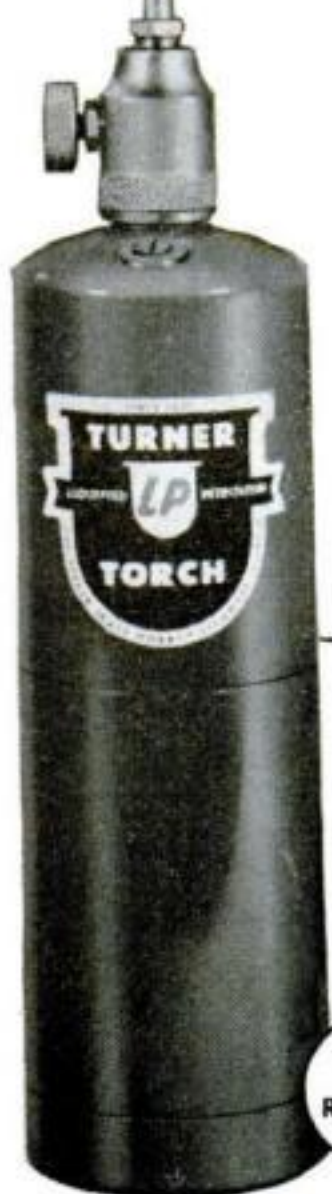
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[Continued from page 234]

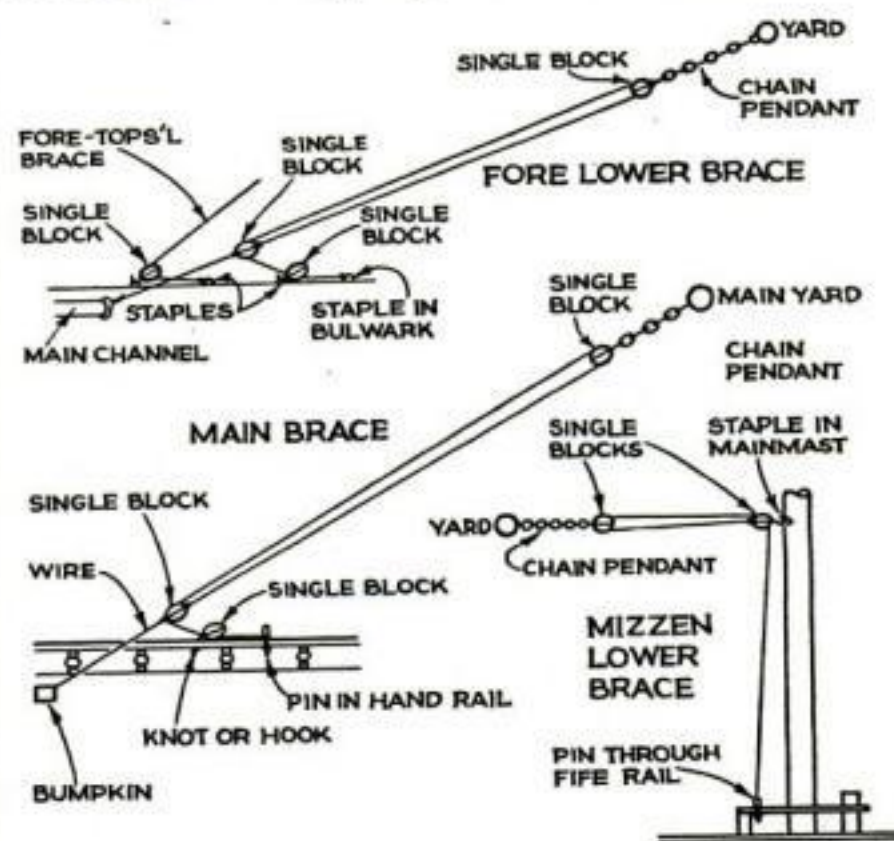
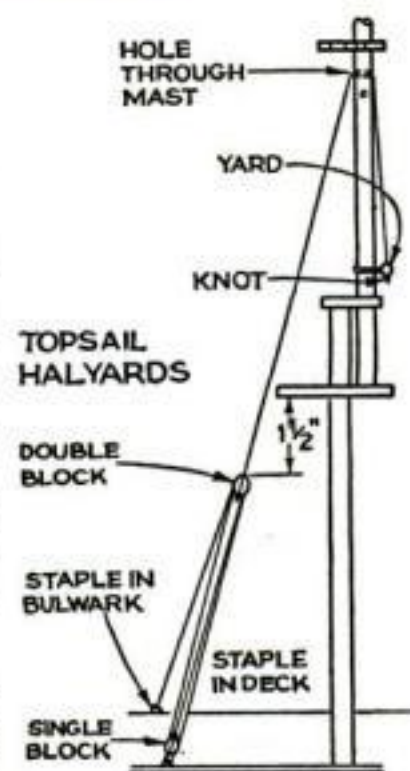
skysail halyards have no blocks at all and come directly to staples in the bulwarks.

The lifts, used to keep the yards level, run from holes in the ends of each yard to the mast. The upper ones go directly to the mast, while the topsail lifts run over the lower cap.

Rigging the braces. These are the tackle that turn the

sails to catch the wind. The lower braces run from the yards to points on the bulwarks or fife rail, as shown below. The other braces run through blocks on the masts before reaching the deck and are shown in dotted lines on the rigging plan. All braces have 1/2" single blocks, and the lower braces have 2"-long chain pendants leading from the yards.

The spanker-boom sheets and topping lifts have two single blocks each. The lower sheet blocks are fastened to staples in the deck and the topping-lift blocks to the after



edge of the mizzen top. The throat halyards have two single blocks, the peak halyard a double block on the cap and a single one on the gaff.

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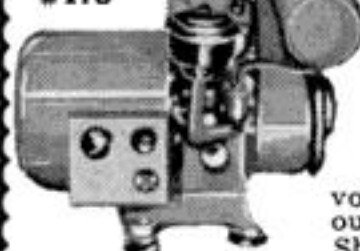


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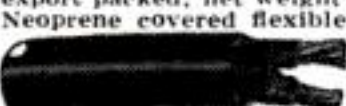


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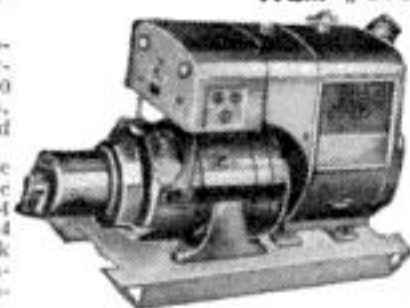
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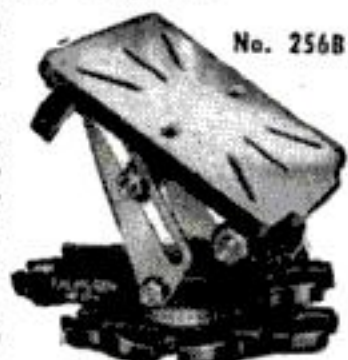


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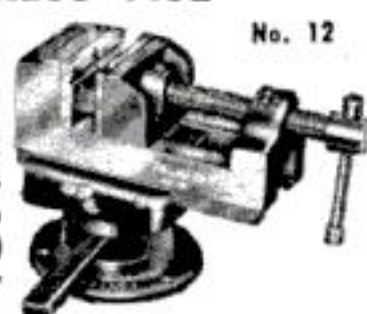


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Gus Rides with Santa Claus

[Continued from page 180]

had been rubbing for a long time against the main battery lead to the starter button. Finally, under Knute's heavy braking, it had been worn through to the bare copper, producing a dead short.

The battery might or might not be capable of taking and holding a charge now. The plates might be too buckled for service. Gus taped the wire, shoved it clear of the brake-pedal arm.

Gus Chews on the Problem

He straightened, fumbled out his pipe with fingers that were stiff with cold, absent-mindedly poured in tobacco that was swept away by the wind, while his mind chewed on the problem. The truck would run on the generator if they could get it rolling fast enough for a husky charge. But the vehicle sat at the bottom of a steep grade, facing a steep upgrade.

"Here," Knute's voice came out of the blackness of the night, "I have a better light than your little one, Gus."

A broad beam emanated from Knute's hands as he spoke, and Gus saw that he had one of those camp lights that are powered with two telephone batteries. Hmm, thought Gus, here were four volts. Would a six-volt ignition system start an engine on four? A car battery with one dead cell would start an engine if it was cranked by hand, even when too weak to turn the starter.

Quickly Gus stripped wire from the tail-light lead and tied the two telephone batteries into the primary ignition circuit, while Knute held the pencil light on the work.

"Now, Knute," he said, "we'll turn her over."

Knute's Crank Is 100 Miles Away

"By yimminy, Gus," Knute said sadly, "I ain't got no crank. Feller next door borrows my crank and my yack—he goes for yuletide a hundred mile." And as if in explanation of the loan, he added, "What poor, raggedy tires that feller had."

"Oh, Lord," Gus groaned. To himself he muttered, "Better start carrying holly, Knute."

Knute's thin, weather-seamed features were centered in the beam of Gus's pencil light. Looking into the faded, blue eyes,

[Continued on page 240]

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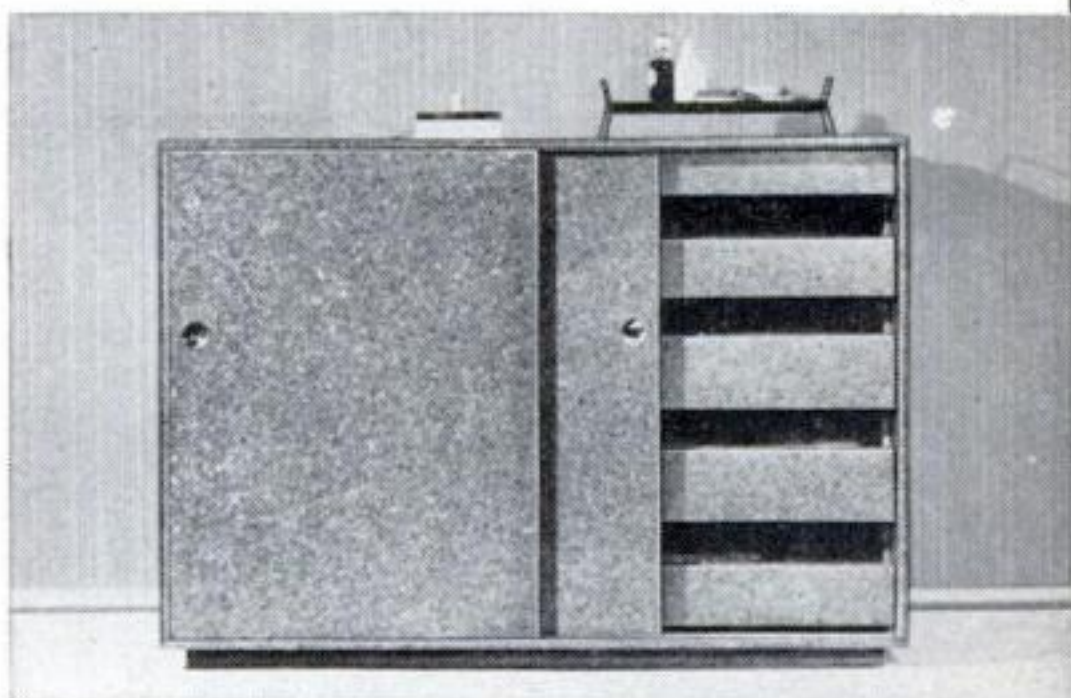
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It's a Complete Unit in Itself. You can carry it home under your arm, set it on a table or workbench, plug it in, and proceed to work on it.



Now this blade gives you 14,400 smooth strokes per minute, just about 5 times as fast as the ordinary jig saw blade. It is especially well suited to delicate fret saw work and it always cuts that smooth edge that requires no sanding. This last feature alone will save you many hours of time which you would ordinarily spend sanding such things as what-not shelves, magazine racks, fern stands and the many other things that you will like to make.



You will find that all the forests of the world are right at your elbow to provide you with rare and beautiful materials for your handicraft. But even with that, you are not limited to wood. Plastic materials are now appearing in a large variety of colors.



For instance, catalin, a molded plastic. It is comparatively easy to work on this jig saw and takes a beautiful polish. Not quite so easy to work, however, as bakelite. Bakelite, for a cast plastic, is hard and brittle and the ordinary saw cuts kind of a splintered or split edge on it. But the high speed and the fine teeth in these Syncro blades always insure a clean cut. You will find that these various plastic materials are particularly nice for working out such things as monogram pins, belt buckles, picture frames and wall lamps.

Now comes the best news of all. Parents especially are glad to know that here is a power jig saw that is safe also for boys and girls to use. Accidental injuries on this machine, even the slightest cuts, are very rare. Serious injuries are impossible. Now that may seem strange to you but the reason is very simple... the Syncro blade does not "pull" the "work" or finger towards it as belt-driven jig saw blades do.



If you happen to have seen a Boy Scout Troop doing handicraft metal work, you will always find a jig saw one of their main tools. Perhaps you have various ideas that you would like to work out in metal; a name plate out of aluminum, a shadow lamp out of copper, or book ends out of brass. You can do all these things on this same machine using the same one blade to cut all those different types of metal, as well as wood, cardboard, etc. And remember that you can do all these things without a great deal of expensive equipment. Actually with only one machine—one jig saw and one blade—one saw you can carry home under your arm, plug it in and go to work on it.



It comes complete with 6 blades and there is nothing else to buy. No belt, no pulley, no motor, or anything else. It is all complete (including built-in motor) in this one unit. The built-in power unit is also guaranteed against burn-out all during your ownership or is replaced free. Syncro is a precision-built, UL-Approved, durable tool, and will last a lifetime. Syncro electrical precision products have been made for 30 years. Your hardware dealer should have one on display.

However, if he is out of stock or no store is near you, send only \$24.95 direct to Syncro Corporation, Dept. G-123, Oxford, Michigan, and your Syncro Jig Saw No. 201 will be shipped to you postpaid. Use it 10 days, then if it does not please you 100%, return saw postpaid to Syncro and your money will be promptly refunded. Or send postcard for Free Circular of Syncro Saw and Syncro Sanders.

100%

Gus Rides with Santa Claus

[Continued from page 238]

Gus saw a man's faith in him die. Knute Hansen had never expected to see a stalled vehicle that Gus Wilson couldn't start.

The wind was howling now. Snow stung their faces. Gus's tiny light was reflected from the blade of an axe, thrust in the side of the pickup, beside the holly.

"Wait, Knute," he cried. "You've got an axe and you're handier with it than a grease monkey."

"By yimminy, Gus," Knute complained, "you been running a yoke on old Knute. I know all along you start my truck easy."

It wasn't easy. It was hard, cold work, up there among the snow-laden trees in the darkness, cutting down a tree that Gus had selected and trimming it of branches. Together they got it down to the pickup truck. Using the tree trunk as a pry, they finally managed to hoist a rear wheel.

Gus Turns the Motor Over

With the motor in gear, Knute in the cab manipulating gas and choke, Gus turned the engine over by spinning the wheel. Gus was cold. His hands were half frozen. Would those four volts be enough?

Never in his life before had the sound of a starting, sputtering engine sounded so good to Gus. He catapulted into the cab, shoving Knute aside. He slapped the truck out of gear, keeping the engine turning over fast enough to throw a full output on the generator. They sat there a long time, while the heater brought them warmth. Then the truck started crawling through the snow, over the mountain.

When, at long last, they drove down the short, single street of Highland, it seemed to Gus that every door in the town burst open in greeting. Folks gathered about the truck, heedless of the storm, women with snow-sprinkled shawls about their heads, bearded men grinning.

"Merry Christmas, Knute!" they chorused. And it seemed to Gus that the time-honored greeting took on a new and deeper meaning.

END

On Their Own

A GANG of road repairmen had forgotten their shovels and phoned their foreman.

He replied: "I'll send the shovels out on another truck. Just lean on each other until they get there."—*Fireman's Fund Record*.



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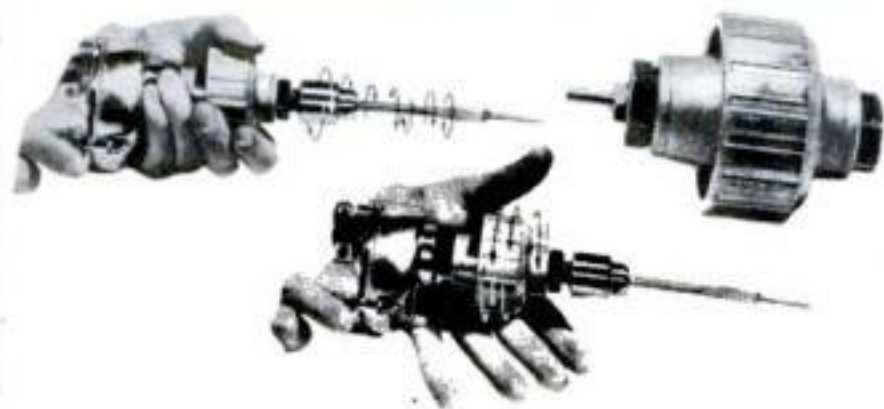
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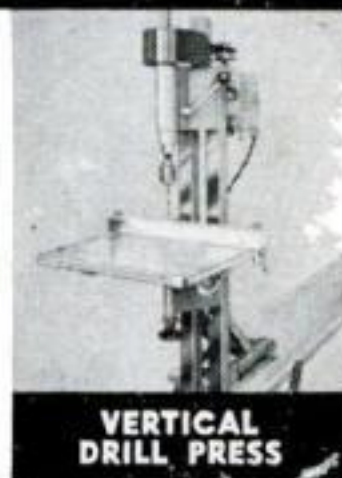
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HASTINGS

STEEL-VENT PISTON RINGS

Regular or Chrome



Tough on Oil-Pumping
Gentle on Cylinder walls

Fastest Freight Train

[Continued from page 143]

Argentina's icer is the mightiest of them all. It is a giant called "Rube Goldberg" by Santa Fe employees. It runs on its own ground-level tracks, takes orders by wireless radio and radio-telephone signals sent through its main power lines, and can ice an empty 65-car train in as many minutes.

Its armlike chutes have already started gesturing over our dusty steel cars. High up on the machine's control platform, its operator presses a button and turns a pointer. Ice by the ton crashes down into the first car's head bunker.

The wheel crew is also hard at work, and soon a black-and-white switcher growls in and starts rearranging 62.

The one reefer bound for St. Louis has to be set out and shunted over to the Wabash line. Since it is 11 cars up from the caboose, that means a little maneuvering. But that's all right, because the entire train has to be taken apart and re-formed for delivery into Chicago. The 19 cars to be taken over by Indiana Harbor Belt and delivered to the various eastern railroads must be at the rear of the train. The four others, bound for Chicago, will be immediately behind the engine.

Cars Rearranged in Seven Moves

In seven switches, the little yard engine has the job done. Meanwhile our new power has rolled up. Its 4,400-horsepower combination revs up, sings a little and moves in reverse to pick up its work for the night.

In a few minutes we're on the Kansas City Terminal right of way. We gain a little speed, clack and rattle across the maze of switches and frogs behind Union Terminal. The station's main control tower has cleared us across its boards of winking colored lights.

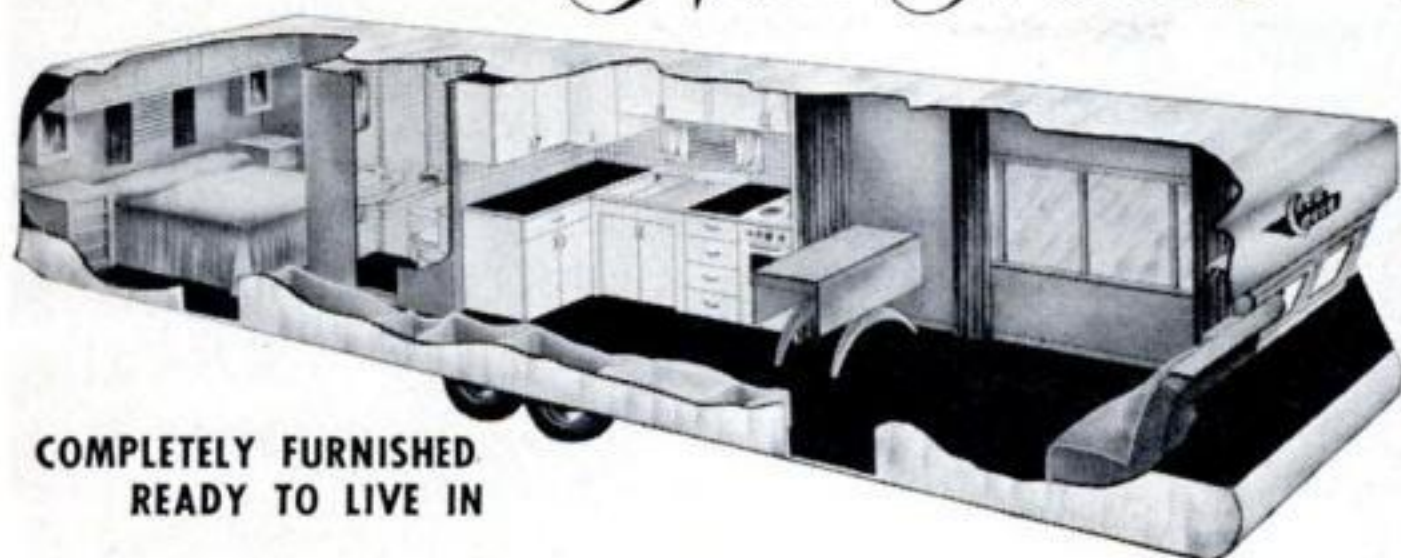
At 5:35 the next morning, the Mississippi, gray and cold, slides under us. Only the prairies and long hills of Illinois lie between us and our destination. We hit 60 and stay there.

[Continued on page 244]

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From its plane stress chassis to its weathertight roof, a New Moon home is tops in built-in comfort. Its thick blanket of insulation, the piano hinges on its doors, the triple trapped enclosed plumbing, its custom cabinet work with mortise and tenoned joining—these are but a few of the many features that make living in a New Moon "carefree." Write for your copy of "Adventures In Living" and learn other advantages.

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KLEAN-STRIP TAKES OFF ANY FINISH

Fastest Freight Train

[Continued from page 242]

But then something is unexpectedly moving. Like a small sun, far behind us, an amber disk seems to be jerking around the bends we've already passed. Then on a long straightaway it grows larger.

Our conductor says it's the Chief, famed Santa Fe streamliner, and in a moment it leaps past us, going at least 90 miles an hour. It will beat us into Chicago by an hour and a half.

Automatic Train Control is now helping run 62. Above and to the left of the engineer's head, with a glass window facing him, is a metal box about a foot high and three inches square. One just like it faces the fireman. This is the ATC signal, and it gives primary control of trains not to their engineers but to the ATC system.

Gives Speed Warnings

When an engineer is rolling his train along, he may have nothing but green semaphores ahead, but if he should inch over the speed limit that ATC is set for, he will get red boards, colored warning symbols on the ATC signal, and blasts from a warning whistle in the cab.

From here on in, we get a whole series of warning signals and keep having to damper our speed.

"Something ahead's sure poking along," grumbles the engineer.

Santa Fe could bring this train through several hours faster, but they leave plenty of slack toward the end because emergencies and delays like these frequently crop up.

Soon, though, we are able to slow for good, wheels grinding as we enter the long Chicago yards on a bright Sunday at noon, 2,195.6 miles from our starting point.

END

Perfect Record

"How many successful parachute jumps does a man have to make before he graduates?" asked the recruit.

"All of 'em," the sergeant replied.—*The Wyatt Way*.



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Here's a complete workshop for the hobbyist or woodworking craftsman—all in one tool. Easy to convert . . . simple to operate, it's precision-built to finest professional quality. All moving parts glide on ball bearings. Tools lock in any position. The most versatile and useful all-purpose woodworking power tool ever developed!

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32 drawers
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Drawers — 1 1/4 in. x 2 3/4 in. x 5 7/8 in.

Just the cabinet to store those hundreds of small items such as nails, screws, nuts, stamps, hobby needs, fishing lures and flies, assembly components, etc. Ideal for gifts, too. Gray baked enamel finish, welded steel, aluminum drawers, rubber feet. Shipped postage prepaid — 32 drawer unit, \$9.95; 16 drawer unit, \$5.95. Satisfaction or your money back. Add 3% sales tax for Ohio orders. Checks or money orders—no C. O. D.'s, please.

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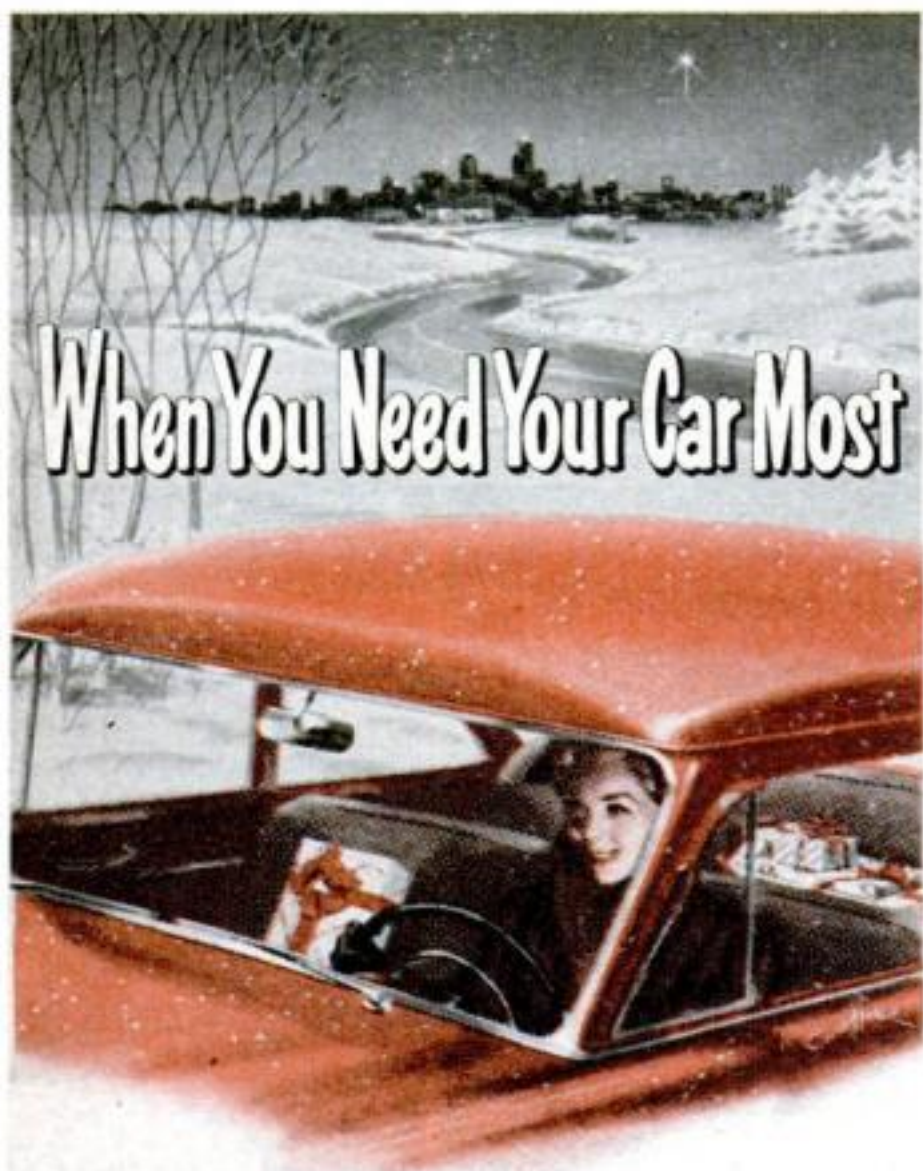
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CARTER CARBURETOR CORPORATION

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Games Disclose Secrets of Success

[Continued from page 128]

have heard to the contrary, top-ranking mathematicians say that there is no system that can safely be applied to any of the games of pure chance.

But where skill also is involved, the sort of calculation that students of the subject have worked out produces solutions to problems like this:

Two men have agreed to fight a duel with revolvers; each is to have three shots. They are to stand 100 paces apart and at a signal start walking toward each other. Each man can start firing whenever he pleases. The problem for you, if you were one of these duelists, is: how far shall I walk before I start shooting? If you start too soon, your bullets are likely to go wild. If you start too late, your opponent may have shot you before you have pulled the trigger.

Students of the science of games are able to answer this question, provided they know how good is the marksmanship of each duelist.

Jet Fighters Get Electronic Advice

This may seem like a waste of time, since not many people fight duels any longer. But in fact it has great and immediate importance. American jet fighters now approach the enemy in the sky at about the speed of sound, which means that the two planes come toward each other at approximately 1,400 miles an hour. The question when to start shooting is a life-and-death matter. Since at such speeds the human brain can hardly arrive at the proper decision, calculations of the Von Neumann type are fed into an electronic computer in the plane, which comes up with approximately the right answer in a fraction of a second.

END

As the Twig Is Bent

Children are

What parents mold them;

Small wonder then

That parents scold them.

—The Right Hand.

DO MORE PLANING JOBS WITH LOW COST BELSAW

Exclusive MONEY-MAKING features:



- Full 12 1/4 in. x 6 in. capacity
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Operate it for 75c per week. Amazing performance. Surprising comfort. All steel construction. Ready to run or assemble it yourself with our bolt together parts. Rider Agents wanted. Send 25c for detailed literature or \$1 (refunded first order) for actual assembly book and service manual filled with photos, drawings, specifications, etc.

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STEEL

Infrared Rays Clarify Bible Texts

[Continued from page 90]

against Rome, and the date of that revolt was 132-135 A.D.

By far the richest find, however, was made by the Bedouins in a cave not more than half a mile away from the one they stumbled upon in 1947. American scholars are inclined to agree with Harding that this find is more important than even the spectacular one of six years ago, even though the manuscripts are not nearly so well preserved.

Scrolls Contain Old Testament Books

For one thing, the new cave has given up many more scrolls or parts of scrolls. So far at least 70 have been identified—among them the Old Testament books of Genesis, Exodus, Leviticus, Numbers, Deuteronomy, Joshua, Ruth, Samuel, Kings, Psalms, Ecclesiastes, Song of Songs, Isaiah, Jeremiah, Lamentations and Ezekiel.

Some of these look older than even the famed Isaiah scroll from the first cave: they may carry us back to the third century B.C., whereas most of the Hebrew texts we now use go back only to about 900 A.D.

This doesn't mean that the new finds are likely to require any great changes in the Bible. In fact, there is every reason to believe that the text of the Old Testament has been handed down, century after century, with amazing accuracy.

Ancient Version Agrees with Modern

For example, the Isaiah scroll from the first cave is a thousand years older than the Hebrew text commonly used, yet the scholars responsible for the Revised Standard Version of the Bible, published last year, found that it was more accurate at only a dozen points, all of them minor. Nevertheless, the only Hebrew texts we have had up to now do contain a number of obscure passages whose meaning translators have had to guess at. Study of the older texts may clarify these points.

[Continued on page 250]

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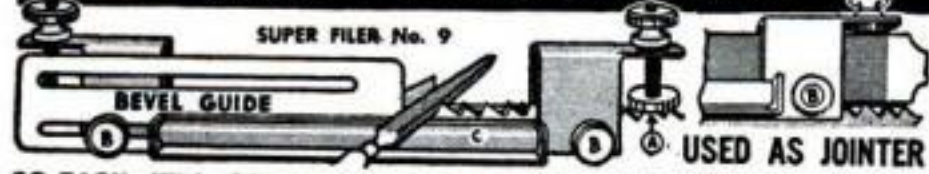
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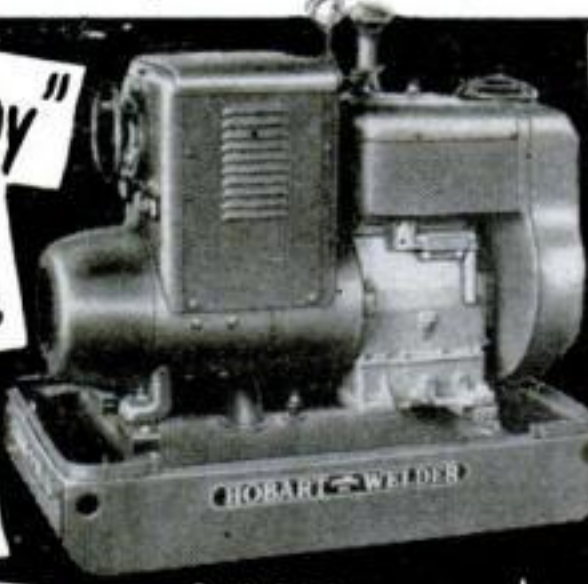
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Infrared Rays Clarify Bible Texts

[Continued from page 248]

Scholars are excited, too, because some of the manuscripts are written not in Hebrew but in a related language called Aramaic. This language was used in some of the later books of the Old Testament. It was also the language spoken by Jesus, and some authorities think that Aramaic, instead of Greek, was used in the original version of parts of the New Testament. Since only a few ancient documents in Aramaic have been found, the new ones are counted on to serve as a sort of textbook leading to a better understanding of the works originally written in that tongue.

Essenes Were Community-Minded

In the Manual of Discipline, found in the 1947 cave, the sect that owned the scrolls referred to itself as *serek hayahad*, which Dr. Millar Burrows, Yale professor and for many years president of the American School of Oriental Research, translates as the Order of Unity. Sects similar to this were known to several ancient, non-Biblical writers as the Essenes, and Pliny the Elder reported that their chief settlement was along the Dead Sea, north of En-Gedi, which is now 'Ain Jidi.

Harding thinks this points fairly certainly to the settlement recently excavated near the scroll caves.

The Essenes gave everything they earned to the community fund. They despised luxury; dressed simply, in white; spent considerable time in prayer and study and in helping others; condemned slavery; and swore to "forever hate the unjust and fight the battle of the just."

Sect May Figure in Old Testament

Is there a relationship between this pious sect and some of the events and teachings recorded in the New Testament? Some Bible scholars have long thought so. They point out that John the Baptist "grew and became strong in spirit," in the words of the Bible, "and

[Continued on page 252]

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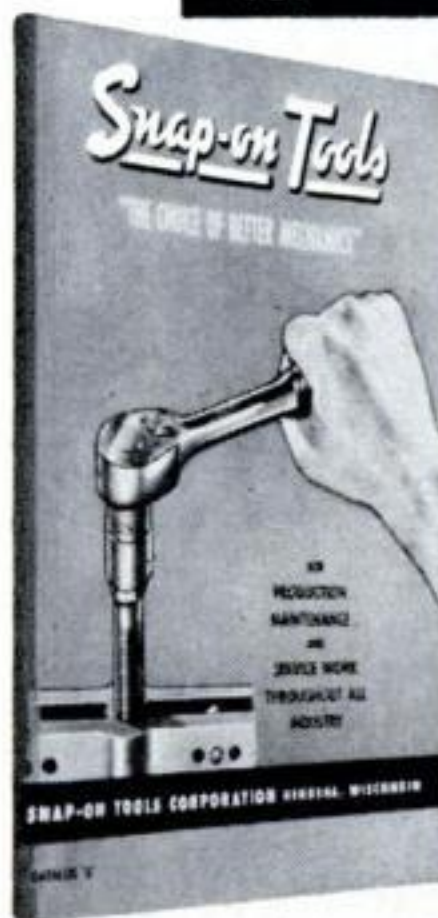
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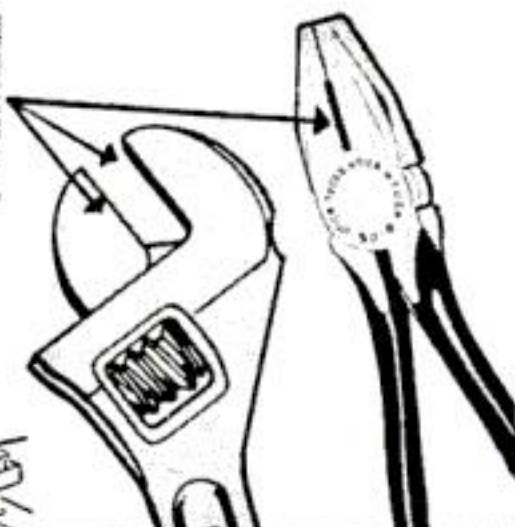
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Infrared Rays Clarify Bible Texts

[Continued from page 250]

he was in the wilderness till the day of his manifestation to Israel."

The Essenes, too, lived in "the wilderness." Furthermore, some of them, abstaining from marriage, brought adopted children into the order; and it is known that they practiced a rite similar to baptism.

In any event, the next we hear about John, he is baptizing in the Jordan River, which runs not far from the ancient settlement at Qumran, and meeting Jesus nearby.

Scholars Employ Scientific Methods

The newest manuscript finds will take a long time to translate, but the staff of the École Biblique, aided by the staff of the American School of Oriental Research, are going about it imperturbably—placing the hardened bits of leather and parchment in humidors to soften, flattening them on glass, photographing them with infrared light (an expensive process paid for by John D. Rockefeller Jr.), and then matching the photographs.

Scraps Are Treated Gently

They go about it gently, too, for these are precious scraps—and the scrolls they formed may once have been held by men acquainted at first hand with some of the events that took place after "there went out a decree from Caesar Augustus, that all the world should be taxed . . . and Joseph also went up from Galilee, out of the city of Nazareth, into Judaea, unto the city of David, which is called Bethlehem . . ."

END

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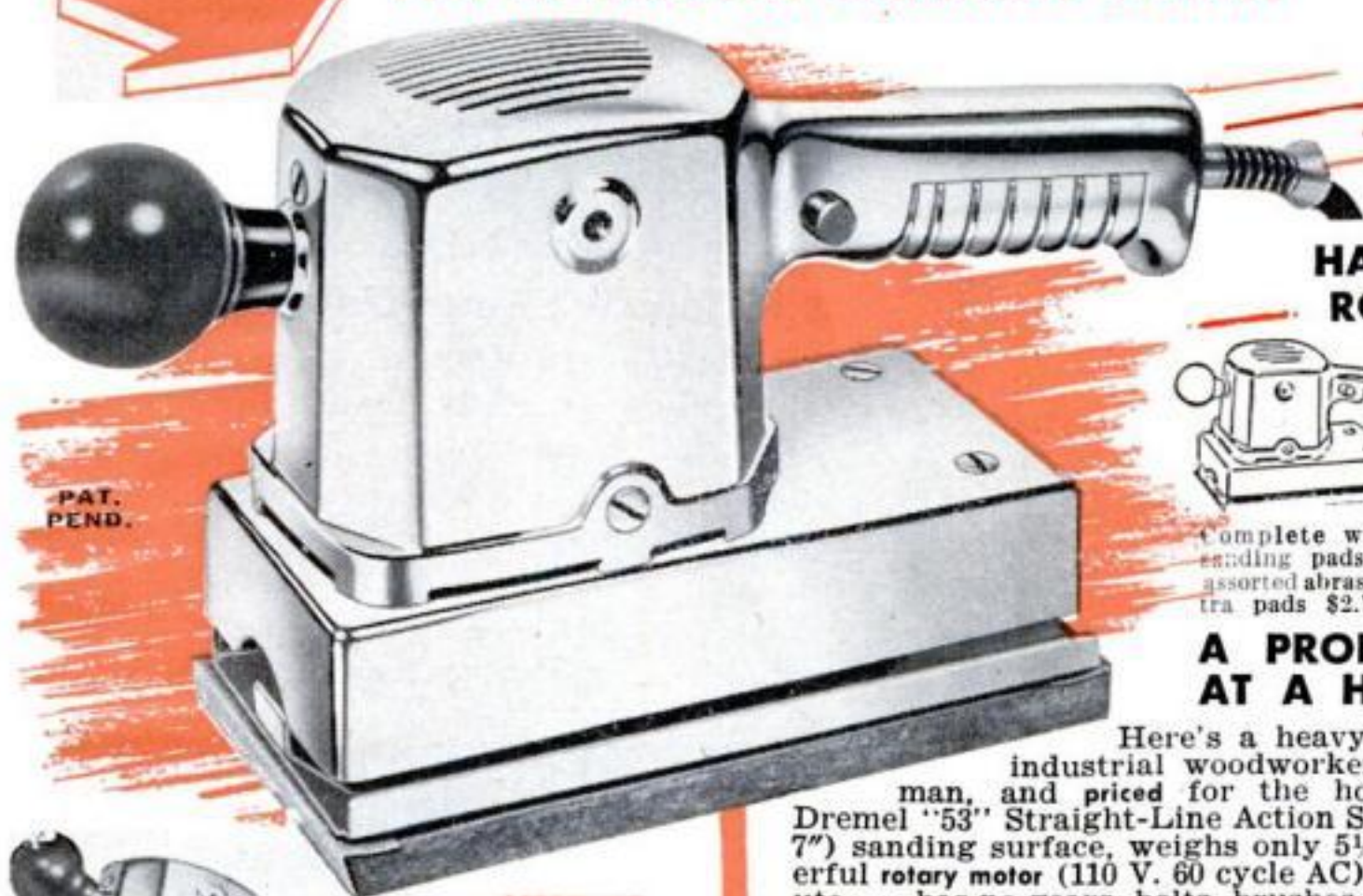
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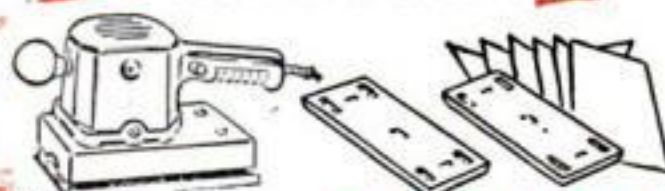
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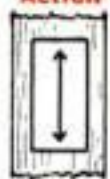
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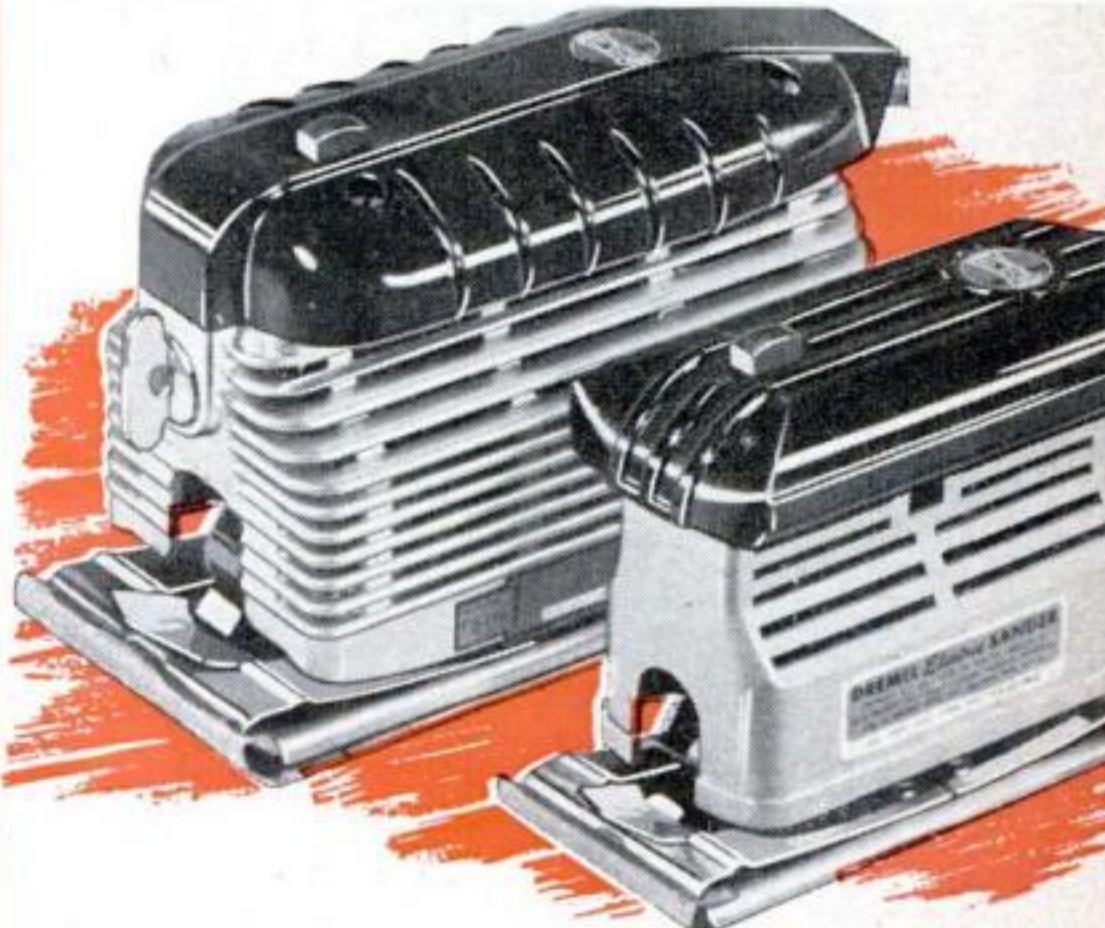
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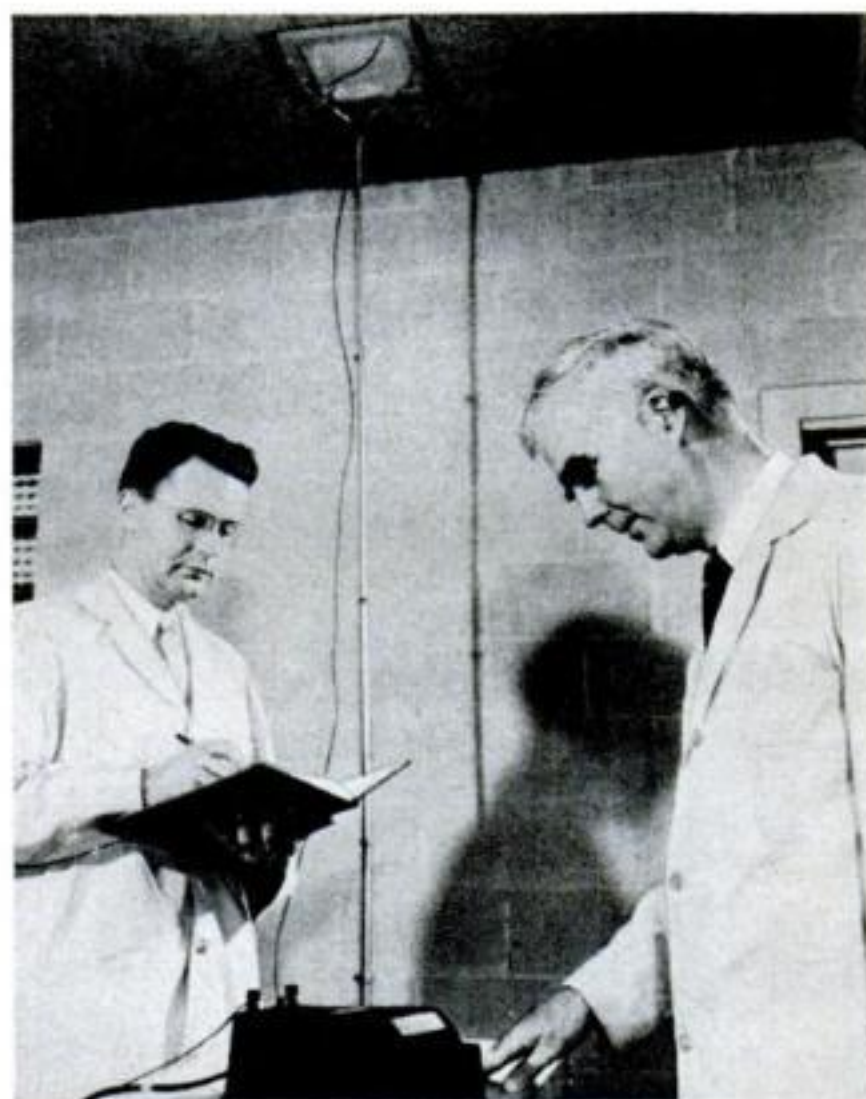
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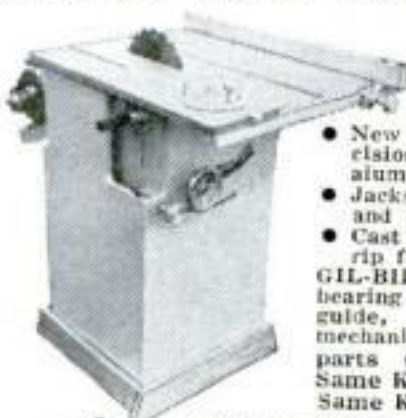
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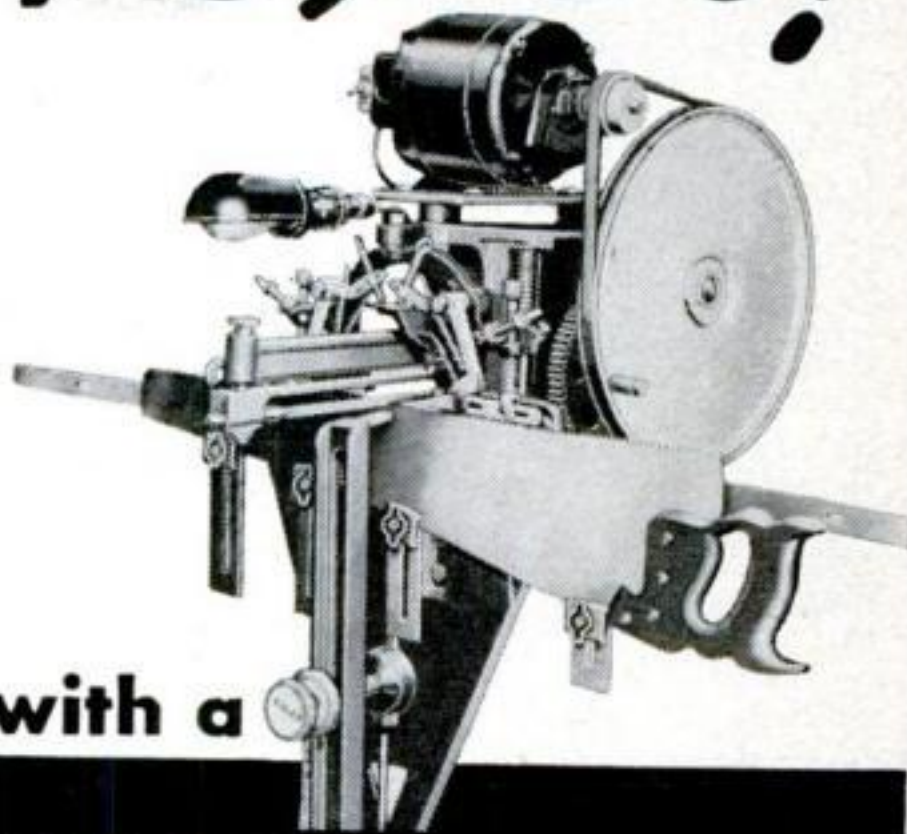
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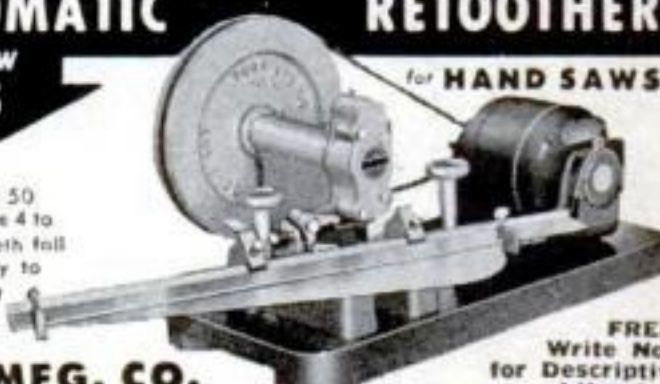
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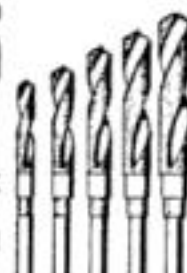
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Electrically operated on 20 to 32 volt AC or DC current. Will develop 1/2 HP with a high torque output. Drive gears are 7000 to 1 ratio. Ideal for use in rotating TV or directional beam antennas. Final take-off gear turns approximately 1-1/4 RPM. **10.95**

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Chemists have hardly more than begun to develop the commercial possibilities of this versatile building block. They know that it can lead to new dyes, disinfectants, detergents; to wrinkle-resistant coatings for textiles; to stronger, more elastic, yet finer synthetic fibers; to new and improved plastics.

Supply Up, Price Down

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Hydrazine, like ammonia, belongs to a family of more than a dozen nitrogen-hydrogen compounds called hydronitrogens. In structure they resemble the

familiar carbon-hydrogen compounds known as hydrocarbons.

Hitherto the industrial chemists have worked most of their miracles with the hydrocarbons, whose carbon atoms can be joined fairly easily into rings and chains, forming building blocks that in turn have yielded wonders like nylon and synthetic rubber.

To a limited extent they have been able to join the nitrogen atoms of the hydronitrogens, too. And this is important, because different qualities are imparted to drugs, dyes and other materials when they contain nitrogen instead of carbon. But building blocks of this kind have not been produced in large quantities, because it has been difficult to hook up the nitrogen atoms of available hydronitrogen compounds.

Hydrazine Makes the Difference

Hydrazine changes the picture. Its favorable structure, with two highly reactive hydrogen atoms swinging from each of two tightly linked nitrogens, makes it an ideal building material of the hydronitrogen family. Already these possibilities are being explored. Further reduction in cost could make hydrazine a serious competitor of the hydrocarbons, as a raw material, in much wider fields. And so big news is in the making, in industrial laboratories, now that the search for a rocket fuel is transforming hydrazine from a scarce and costly material into a readily available and popular-priced commodity. END

Simple Explanation

THE chemistry professor was giving a demonstration of the properties of various acids. "Now, I am going to drop this silver dollar into this glass of acid. Will it dissolve?"

"No," was the prompt reply from a student in the rear.

"No?" queried the professor. "Then perhaps the young man will explain why the silver dollar won't dissolve."

"Because," said the student, "if it would, the professor would not drop it in."—*The Columbian Crew.*

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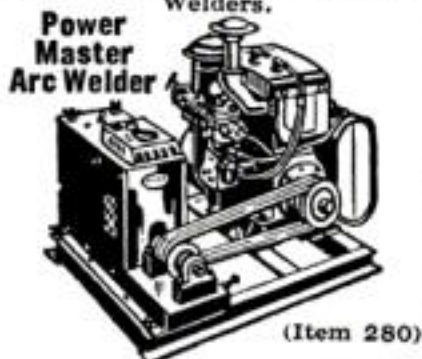
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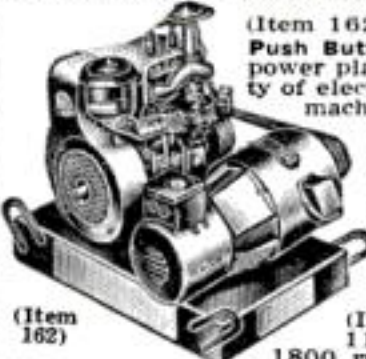
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Push Button Start, 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 14 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth \$995.00. With self starter. Factory price..... **\$645.00**

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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area.

Quiet, super efficient fan moves huge volume of air. (400 to 600 CFM).

8" Fan, wt. 5 lb..... **\$6.85**
9" Fan, wt. 6 lb..... **\$7.85**
10" Fan, wt. 7 lb..... **\$8.85**
12" Fan, wt. 8 lb..... **\$9.85**

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E) **\$11.95**
12" Fan, wt. 10 lbs. (Item 10D) **\$12.95**

MASTER AIR COMPRESSOR

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing & the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter.



Master built with high strength alloys and precision bearings. Stainless steel tank, 12"x24", 2100 cu. in. cap. Heavy duty automatic switch starts and stops motor to maintain desired pressure (up to 150 lb.). Has check valve, safety valve, gauge, shut-off valve. 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices.

6 FT. FLEXIBLE SHAFT

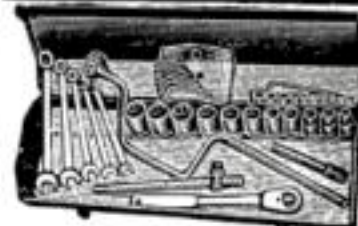
A precision built, heavy duty tool with amazing flexibility. Replaces a dozen individual tools—drills, buffs, grinds, sands, saws—handles jobs in impossible places. Fits any 5/8" motor shaft or use with drill press, grinder, lathe, gas engine, etc. Heavy duty 3/4" piano wire core encased in tough rubber housing. Handle and arbor have rugged industrial type precision ball bearings for years of service. Arbor takes all 1/2"-20 standard threads. Use with any 1/4, 1/2 or 1/2 hp motor. Wt. 10 lbs. Reg. \$29.95... **\$15.95**

With 1/4 hp. motor, 110v. AC motor. Reg. \$175. (Item 209p)..... **\$109.50**

With 1/2 hp. motor, Reg. **\$129.50** (Item 209Ap)

2 hp. Briggs Gas Engine. Reg. **\$199.50** (Item 209Bp)..... **\$119.50**

37 Pc. SOCKET SET



Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome alloy. Absolutely the best. Complete range of 17 sockets from 1/4" thru 1 1/2" (1/4" drive) and 7/16" thru 1-1/16" (1/2" drive). 1 extension, reversible 1/2" ratchet, adapter bit, sliding "T" handle, "L" handle, 1/2" speeder, 5 pc. alloy combination wrench set, 8 pc. Allen wrench set, and a big doghouse tool box. We challenge anyone to match this value. Easily worth \$41.95. Wt. 14 lb. (Item 59)..... **\$16.95**

44 Pc. SOCKET SET

(Item 596) Same unconditionally guaranteed, non-breakable sockets as above—but with added sizes. Complete range of 21 sockets from 1/4" thru 7/16" (1/4" drive) & 7/16" thru 1-1/16" (1/2" drive). Two extensions, reversible 1/2" ratchet, 3 drift punches, sliding "T" head, all angle coupling, 1/2" speeder, 1/4" breakerover, 5 pc. high chrome alloy combination wrench set and 8 pc. offset wrench set in big doghouse tool with ample room for other tools. Reg. \$49.50 **\$21.95**

52 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in 1/2" drive, 3/8" drive and 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy hand-some steel box. Wt. 17 lbs. List price \$62.90 **\$27.95**

JET FLOW BLOWER

Tremendous air movement (1700 CFM) and quiet operation make this double inlet 10" turbine blower unbeatable for heating, cooling, drying and air conditioning. Ideal for attic or barn ventilation, converting gravity heating to forced air; spray booth exhausts, etc. Operates with any 1/4, 1/2 or 1/2 HP motor. Oversized, long life bearings. Includes variable speed motor pulley and belt. Dimensions 19" hi. x 8 x 16 1/4". Outlet opening 13"x11 3/4". Wt. 45 lbs. (Item 245). Reg. \$54.50. Special. **\$27.50**

HEAVY DUTY 1/4 HP motor for above..... **\$16.95**

EXTENSION CORD



(Item 16) Heavy duty, made of Buna rubber insulated #14-2 conductor, stranded wire encased in a treated braid jacket. So tough that you can drive over it. Use indoors or out. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Complete with heavy rubber plug and outlet. Comb. 2-40 ft. & 1-20 ft. (total 100 ft.) (Item 16c) **\$4.95**

Variable Speed Selector

Heavy duty, made by B. F. GOODRICH for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, conveyors, production lines, hoists—any operation requiring variable speed. Ideal for midge autos. Employs reliable "trouble-free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: 1/2-1 hp. wt. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list \$228, \$252 and \$352. Our prices... **\$79.50, \$89.50 and \$114.50.**



SOUTH BEND

13" Precision Lathes

**for accurate,
low-cost machining**

These lathes are popular in the toolroom, production shop, or wherever varieties of precision parts are machined. Users prefer them for their simplicity and practically effortless handling. Job set-ups and tooling changes are made so quickly and easily that down-time is held to a minimum. A very complete line of attachments simplifies tooling. Send coupon for complete information.

SPECIFICATIONS

Swing — 13 $\frac{1}{8}$ " over bed and saddle wings, 8" over cross slide.

Distances Between Centers — 28 $\frac{1}{4}$ ", 40 $\frac{1}{4}$ ", 52 $\frac{1}{4}$ " maximum.

Collet Capacity — 1" maximum (Collets interchangeable with South Bend 10"-1" Collet, 14 $\frac{1}{2}$ ", 16" and 16-24" lathes).

Spindle Bore — 1 $\frac{3}{8}$ ".

Spindle Speeds — Eight, 40 to 940 r.p.m., approximate.

Power Longitudinal Feeds — 48 R.H. or L.H., .0015" to .0841".

Power Cross Feeds — 48, .0006" to .0315".

Thread Cutting — 48 R.H. or L.H. pitches, 4 to 224 per inch.

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Every machinist needs "How to Run a Lathe." This helpful handbook contains 128 pages and over 365 illustrations and diagrams on all phases of lathe operation and care. Price postpaid 50 cents.



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When? How?

Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

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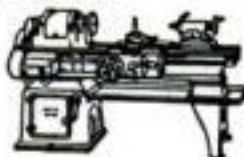
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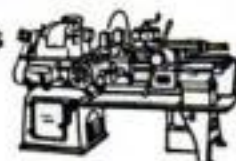
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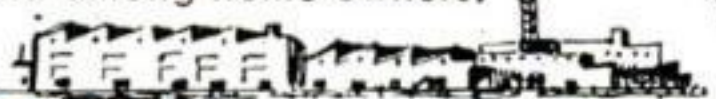
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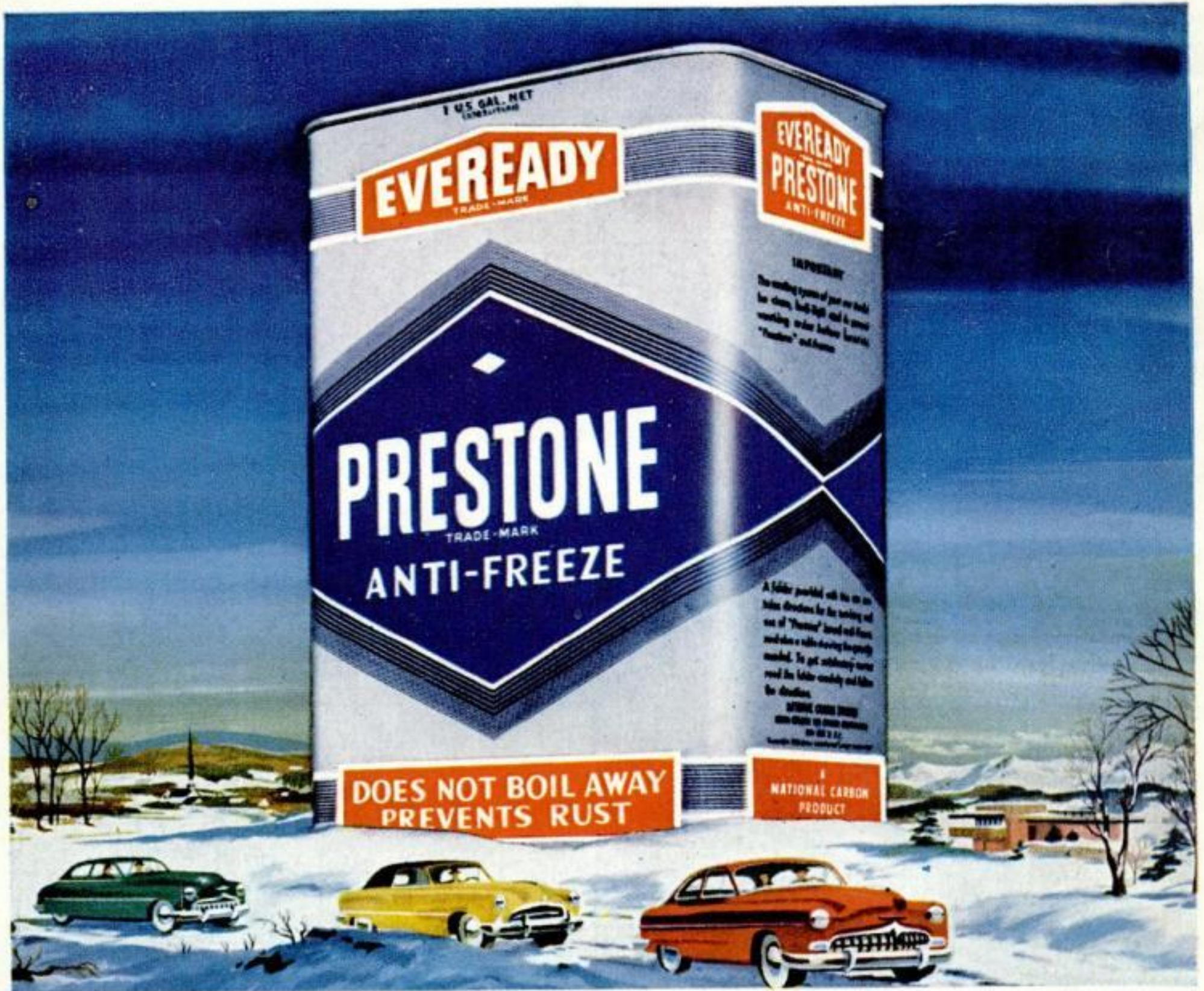
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